

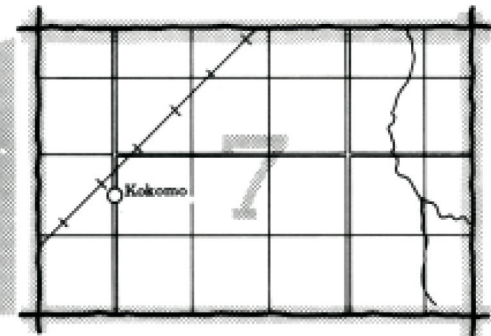
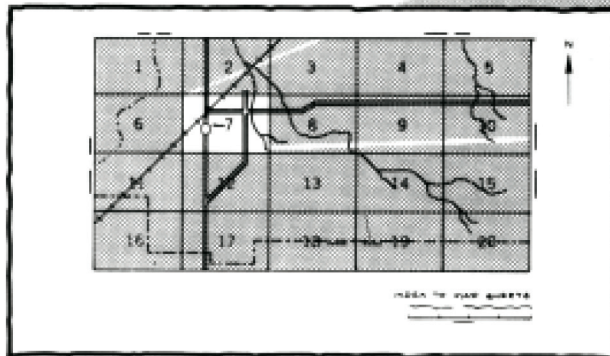
soil survey of  
**Victoria County, Texas**



United States Department of Agriculture  
Soil Conservation Service  
in cooperation with  
Texas Agricultural Experiment Station

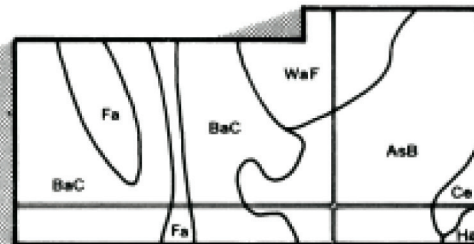
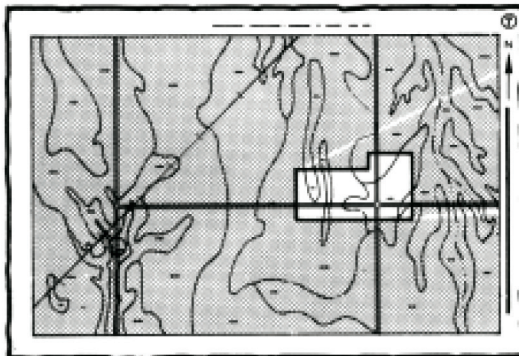
# HOW TO USE

1. Locate your area of interest on the "Index to Map Sheets"

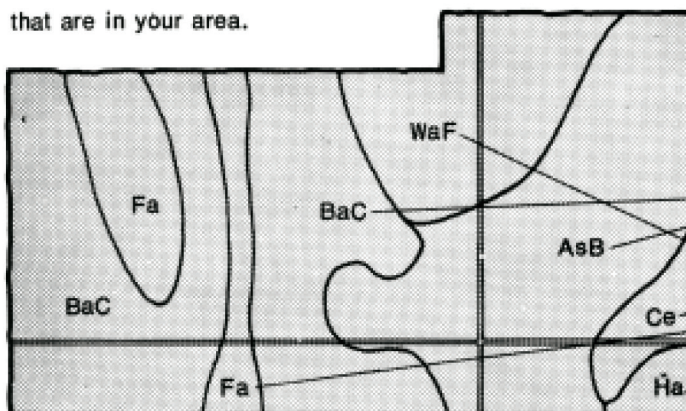


2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



4. List the map unit symbols that are in your area.



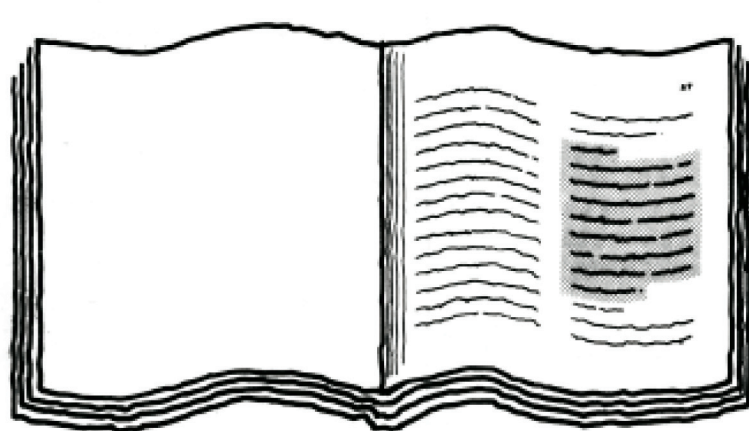
## Symbols

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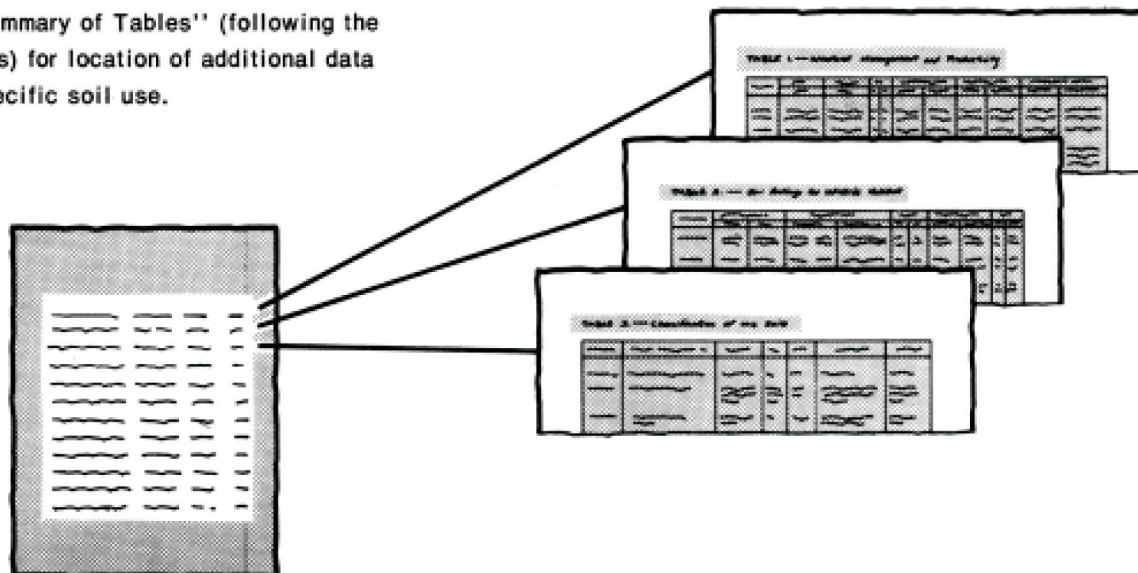
# THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



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6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



Consult "Contents" for parts of the publication that will meet your specific needs.

7. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

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This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was performed in the period 1975-79. Soil names and descriptions were approved in 1979. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1979. This survey was made cooperatively by the Soil Conservation Service and the Texas Agricultural Experiment Station. It is part of the technical assistance furnished to the Victoria Soil and Water Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

This survey supersedes the soil survey of Victoria County published in 1927 (13).

*Cover: Crop residue is incorporated into the soil in this area of Meguin silty clay, occasionally flooded, to help maintain soil structure and tilth. This area is to be planted to grain sorghum.*



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# foreword

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This soil survey contains information that can be used in land-planning programs in Victoria County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

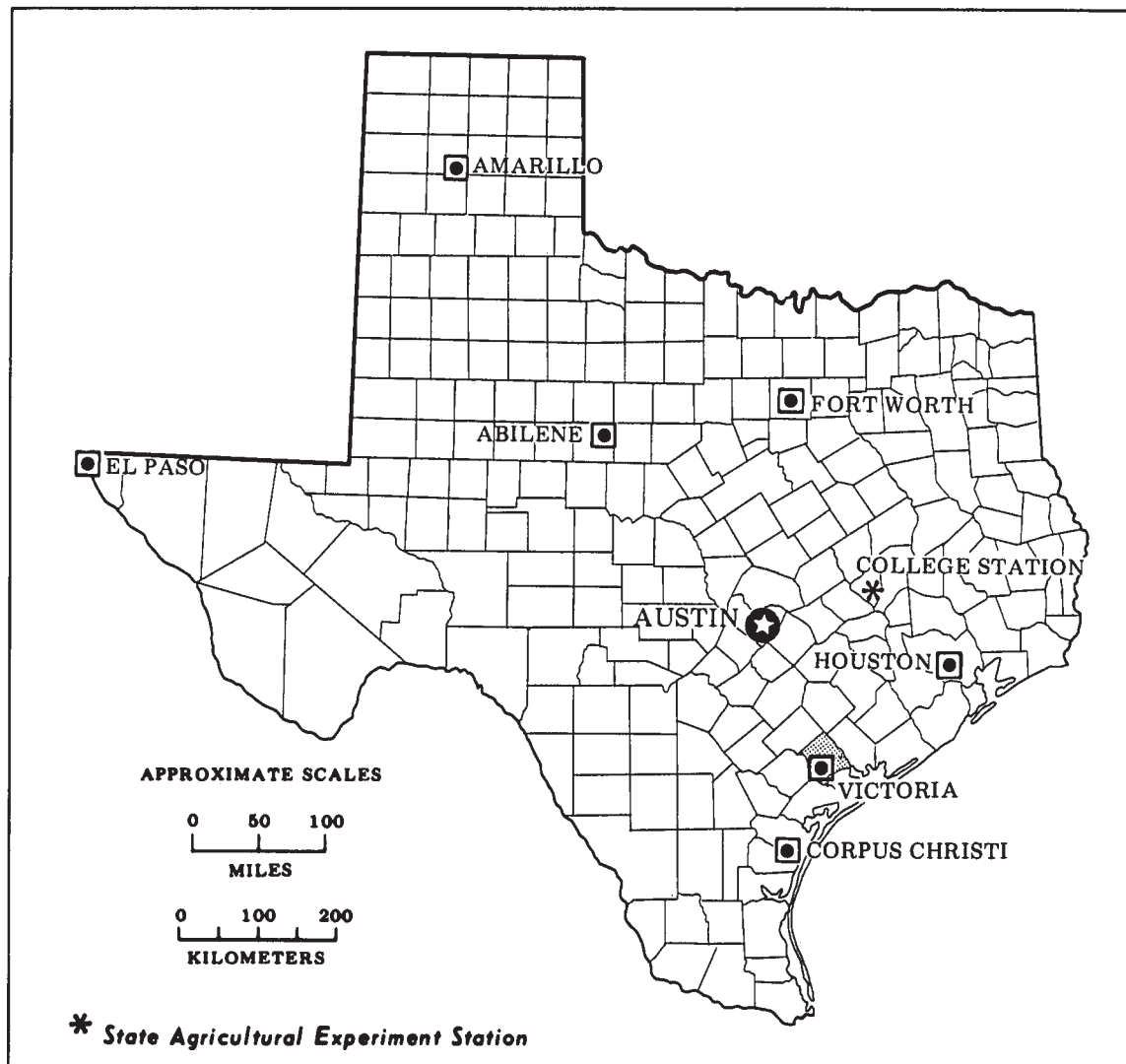
This soil survey is designed for many different users. Farmers, ranchers, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.



George C. Marks  
State Conservationist  
Soil Conservation Service



*Location of Victoria County in Texas.*



# soil survey of Victoria County, Texas

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By Wesley L. Miller, Soil Conservation Service

Soils surveyed by Stanley D. Clemmons, Plinio H. Flores, Alan C. Peer  
Wesley L. Miller, Roy H. L. Bruns, James E. Bower, and Irvin C. Mowery  
Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service  
in cooperation with  
Texas Agricultural Experiment Station

VICTORIA COUNTY is in the southeastern part of Texas. It has an area of about 894 square miles, or 572,160 acres, of which 2,330 acres is water.

Most of the county is a nearly level to gently sloping plain that is dissected by a few well-defined streams and rivers. The northwestern part of the county is mainly gently sloping and is dissected by many well-defined drainageways. The Guadalupe River dissects the central part of the county. It flows to the southeast. Coleta Creek forms most of the western boundary, and the San Antonio River forms part of the southern boundary of the county. Arenosa and Garcitas Creeks form the eastern boundary. Elevation ranges from sea level in the southern part of the county to 200 feet above in the northern and northwestern parts.

The major land uses in Victoria County are cattle ranching and farming. In 1967, about 68 percent of the county was rangeland, 21 percent was cropland, 4 percent was pastureland and hayland, and 4 percent was urban and built-up areas and water areas (12). The rest was idle land.

Victoria County is in the Gulf Coast Prairies and Texas Claypan Major Land Resource Areas (3). The soils in the Gulf Coast Prairies Area formed under prairie vegetation and are dominantly dark, loamy, and clayey. The soils in the Texas Claypan Area formed under post oak savannah vegetation and are dominantly light colored, loamy, and sandy.

Slope is the main management concern on all the soils of the survey area. The nearly level soils are often

seasonally wet and need adequate drainage outlets. The rest are susceptible to sheet and gully erosion if they are not protected.

Descriptions and names of soils in this soil survey do not fully agree with those on soil maps for adjacent counties. Differences are the result of better knowledge of soils, modifications in series concepts, intensity of mapping, or extent of soils within the survey area.

## **general nature of the survey area**

This section briefly discusses settlement and population, climate, agriculture, and natural resources.

## **settlement and population**

Victoria County was established by the Republic of Texas in 1836. It was created from Guadalupe Victoria, a Mexican municipality.

Early settlements in the area were made by French and Spanish explorers. The French explorer La Salle established a small fort along Garcitas Creek in 1685 (7). In 1722, the Spanish established a mission and fort near the site of the La Salle fort, which had by then been abandoned. The Spanish later moved the mission and fort to a site on the Guadalupe River northwest of Victoria. The community of Mission Valley is near this site.

The first permanent settlement in the area was a colony established by the rancher Martin de Leon. The city of Victoria, the county seat, is on the site along the Guadalupe River that was selected by de Leon in 1824.

In 1976, the population of the county was approximately 59,907, and Victoria had an estimated population of 46,490.

## climate

Prepared by the National Climatic Center, Asheville, North Carolina.

The climate of Victoria County is humid subtropical. Winters are mild. Polar Canadian air masses that move southward across Texas and out over the Gulf in winter produce cool, cloudy, rainy weather. Precipitation is most often in the form of slow, gentle rains. Spring weather is variable, though moderate overall. March is relatively dry, but thundershower activity increases in April and May. Summer weather varies little. Summer months have abundant sunshine and are relatively dry. Occasional slow-moving thunderstorms or other weather disturbances may dump excessive amounts of precipitation on the area. Fall is moderate. In this season, rainfall increases, but frequently there are periods of mild, dry, sunny weather. Heavy rains may occur early in fall in association with tropical disturbances, which move westward from the Gulf. Tropical storms are a threat to the area in summer and fall, but severe storms are rare.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Victoria in the period 1961 to 1978. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 55 degrees F, and the average daily minimum temperature is 44 degrees. The lowest temperature on record, which occurred at Victoria on January 12, 1962, is 16 degrees. In summer the average temperature is 83 degrees, and the average daily maximum temperature is 92 degrees. The highest recorded temperature, which occurred on August 13, 1962, is 107 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 38 inches. Of this, 25 inches, or 65 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 20 inches. The heaviest 1-day rainfall during the period of record was 9.3 inches at

Victoria on June 15, 1977. Thunderstorms occur on about 50 days each year, and most occur in summer.

Average seasonal snowfall is less than 1 inch. The greatest snow depth at any one time during the period of record was 1 inch.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 90 percent. The sun shines 70 percent of the time possible in summer and 50 percent in winter. The prevailing wind is from the south-southeast. Average windspeed is highest, 12 miles per hour, in spring.

## agriculture

In 1726, Spanish missionaries met with their first success in cattle raising in Texas along the Guadalupe River in Victoria County. Around 1770, the missionaries claimed 40,000 head of cattle, making the area one of the first great cattle ranching areas in Texas. Cattle ranching is now the main agricultural enterprise in the county.

Corn was one of the first important crops in Victoria County. Around the time of the Civil War, considerable cotton was raised and ginned. In recent years, grain sorghum has replaced cotton as the major crop. Grain sorghum, rice, and corn are now the main crops.

## natural resources

Victoria County has natural resources of oil, natural gas, sand and gravel, and fresh water. Commercial production of oil and natural gas began in the early 1930's. Sand and gravel is mined in areas along the Guadalupe River and is transported to other coastal areas via the Victoria Barge Canal and Intercoastal Canal System. A large underground reservoir and several major rivers and streams in the county provide an abundant supply of water for home and industrial uses.

## how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the

boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those

characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, rangeland managers, engineers, planners, developers and builders, home buyers, and others.





# general soil map units

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The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

## soil descriptions

### **Nearly level to gently sloping clayey and loamy soils on uplands**

The soils in this group make up about 39 percent of the county. The main soils are Lake Charles and Dacosta soils.

The surface layer is clayey or loamy, and the subsoil is clayey. These soils are somewhat poorly drained and very slowly permeable.

In most areas these soils are used as cropland. Grain sorghum and corn are the principal crops. In some areas these soils are used as rangeland. The native range plants are mid and tall grasses.

The soils in this group are poorly suited to urban uses.

#### **1. Lake Charles-Dacosta**

*Somewhat poorly drained, very slowly permeable clayey and loamy soils*

This map unit consists of nearly level to gently sloping soils that have slopes mainly less than 1 percent. It makes up about 39 percent of the county. It is about 47 percent Lake Charles soils, 29 percent Dacosta soils, and 24 percent other soils (fig. 1).

Lake Charles soils typically have a black, neutral clay surface layer about 23 inches thick. Below that, to a depth of 80 inches, is moderately alkaline clay that is very dark gray in the upper part, dark gray in the middle part, and very pale brown in the lower part.

Dacosta soils typically have a very dark gray surface layer of sandy clay loam about 6 inches thick. The subsoil from 6 to 12 inches is very dark gray sandy clay loam. From 12 to 40 inches it is dark gray sandy clay and clay, and from 40 to 52 inches it is light brownish gray sandy clay. The lower part of the subsoil to a depth of 78 inches is light brownish gray sandy clay loam. These soils are slightly acid in the upper part and moderately alkaline in the lower part.

Of minor extent in this map unit are Edna, Contee, Faddin, Telferner, Nada, and Cieno soils. The deep loamy Edna, Contee, Faddin, Nada, and Telferner soils are on upland plains. The deep loamy Cieno soils are in slight depressions on uplands.

In most areas these soils are used as cropland. In some areas they are used as rangeland.

These soils are well suited to crops. Grain sorghum and corn are the principal crops.

Native range plants are mostly little bluestem, indiagrass, switchgrass, brownseed paspalum, and sensitivebrier.

Because of their shrink-swell potential and wetness and because of their low strength, which affects roads and streets, these soils are poorly suited to most urban uses.

### **Nearly level to gently sloping loamy soils on uplands**

The soils in this group make up about 36 percent of the county. The main soils are Nada, Telferner, Edna, Inez, and Faddin soils.

The surface layer is loamy, and the subsoil is loamy or clayey. These soils are somewhat poorly drained and poorly drained and are very slowly permeable.

In most areas these soils are used as cropland and rangeland. Rice, grain sorghum, and corn are the principal crops. The native range plants are mainly mid and tall grasses and scattered post oak and live oak.

The soils in this group are poorly suited to urban uses.

#### **2. Nada-Telferner**

*Poorly drained and somewhat poorly drained, very slowly permeable loamy soils*

This map unit consists of nearly level to gently sloping soils that have slopes of 0 to 3 percent. It makes up about 17 percent of the county. It is about 37 percent Nada soils, 33 percent Telferner soils, and 30 percent other soils (fig. 2).

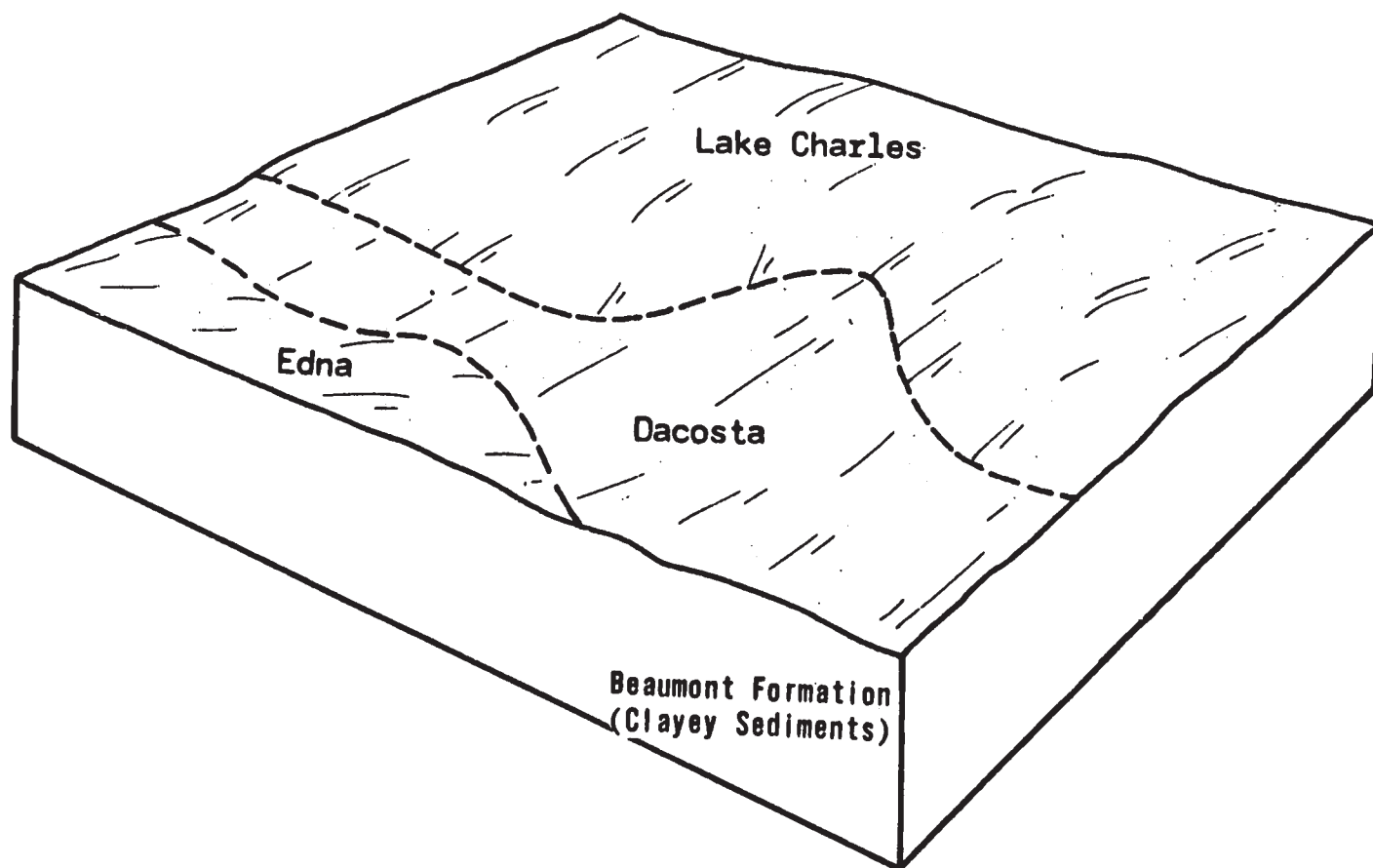


Figure 1.—Pattern of soils and underlying material in the Lake Charles-Dacosta map unit.

Nada soils typically have a surface layer of dark grayish brown sandy loam about 8 inches thick. The subsoil from 8 to 80 inches is dark gray and grayish brown sandy clay loam in the upper part and grades to light brownish gray sandy clay loam in the lower part. The subsoil has brownish and yellowish mottles throughout. These soils are neutral in the upper part and grade to moderately alkaline in the lower part.

The Telferner soils typically have a surface layer of dark grayish brown fine sandy loam about 10 inches thick. The subsurface layer is light brownish gray fine sandy loam about 6 inches thick. The subsoil from 16 to 24 inches is mottled, grayish brown sandy clay. From 24 to 40 inches it is mottled, light brownish gray clay loam; and from 40 to 50 inches it is mottled, light gray clay loam. The lower part of the subsoil to a depth of 80 inches is mottled, light gray sandy clay loam. These soils are slightly acid in the upper part and grade to moderately alkaline in the lower part.

Of minor extent in this map unit are Cieno, Fordtran, Inez, Garcitas, and Degola soils. The deep loamy Cieno soils are in depressions on uplands. The deep loamy Fordtran soils are on upland plains. The deep loamy Inez soils are on uplands near major streams. The deep sandy Garcitas soils are on low ridges and side slopes along drainageways. The deep loamy Degola soils are on flood plains of tributaries of large streams.

In most areas these soils are used as cropland and rangeland.

These soils are well suited to crops. Rice and grain sorghum are the principal crops.

The native range plants are dominantly little bluestem, switchgrass, indiagrass, eastern gamagrass, Florida paspalum, big bluestem, and Maximilian sunflower.

Because of their wetness and because of their low strength, which affects roads and streets, these soils are poorly suited to most urban uses.

### 3. Telferner-Edna

*Somewhat poorly drained and poorly drained, very slowly permeable loamy soils*

This map unit consists of nearly level to gently sloping soils that have slopes of 0 to 3 percent. It makes up about 13 percent of the county. It is about 75 percent Telferner soils, 22 percent Edna soils, and 3 percent other soils.

Telferner soils typically have a surface layer of dark grayish brown fine sandy loam about 10 inches thick. The subsurface layer is light brownish gray fine sandy loam about 6 inches thick. The upper part of the subsoil, between depths of 16 and 24 inches, is mottled, grayish brown sandy clay. From 24 to 40 inches it is mottled, light brownish gray clay loam; and from 40 to 50 inches it is mottled, light gray clay loam. The lower part of the subsoil to 80 inches is mottled, light gray sandy clay loam. These soils are slightly acid in the upper part and grade to moderately alkaline in the lower part.

Edna soils typically have a surface layer of dark grayish brown fine sandy loam about 8 inches thick. The subsoil from 8 to 80 inches is mottled, dark gray clay in the upper part and grades to grayish brown sandy clay and then to light yellowish brown clay loam in the lower part. These soils are slightly acid in the upper part and grade to moderately alkaline in the lower part.

Of minor extent in this map unit are Lake Charles, Dacosta, Nada, Cieno, Fordtran, Kuy, and Rupley soils on uplands. The deep clayey and loamy Lake Charles and Dacosta soils are on plains. The deep loamy Nada and Cieno soils are in slight depressions. The deep Kuy, Fordtran, and Rupley soils are sandy soils.

In most areas these soils are used as rangeland. In a few areas they are used as cropland.

These soils are moderately well suited to crops. Rice, grain sorghum, and corn are the principal crops.

Native range plants are dominantly little bluestem, indiagrass, Florida paspalum, brownseed paspalum, Maximilian sunflower, and bundleflower.

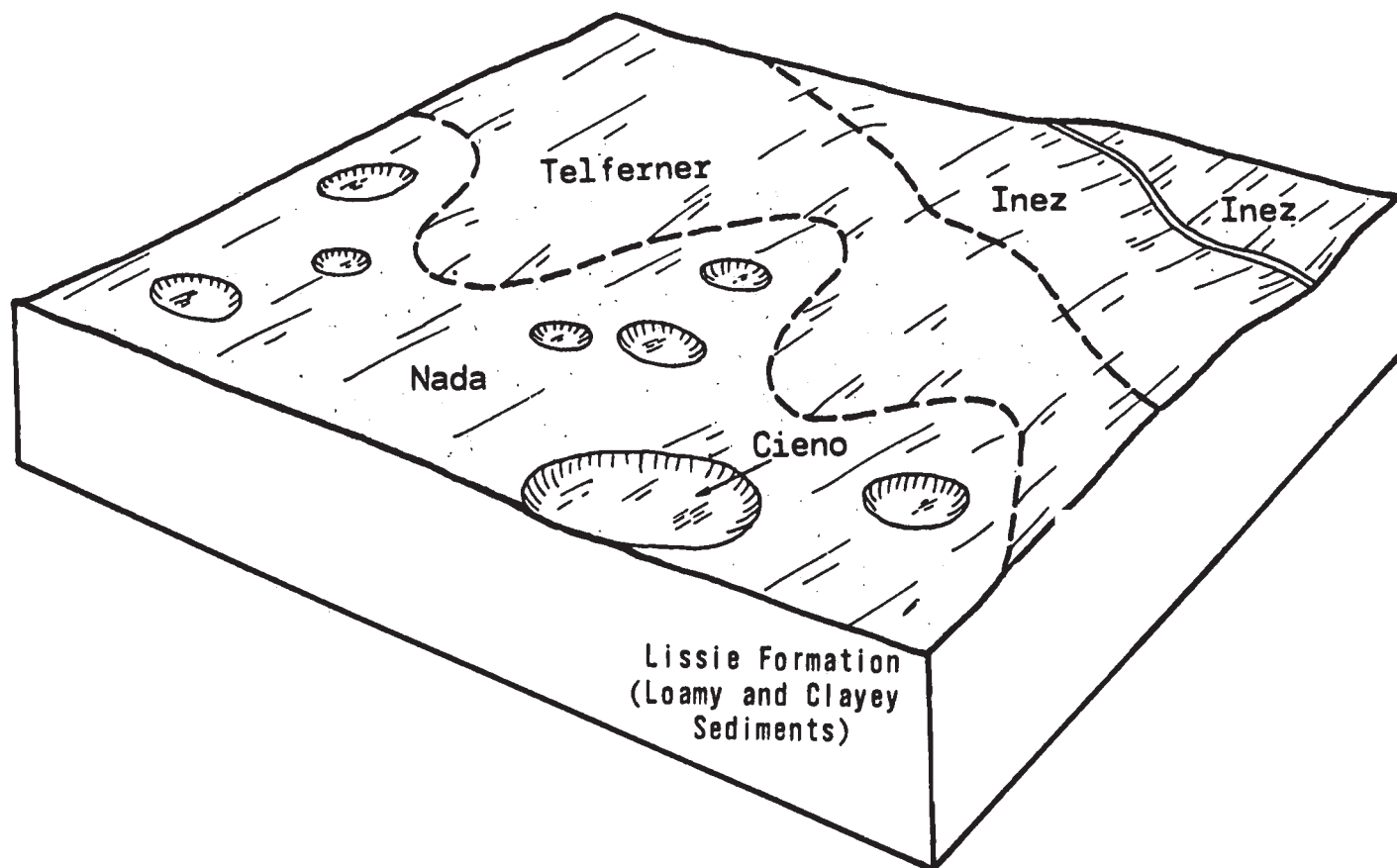


Figure 2.—Pattern of soils and underlying material in the Nada-Telferner and Inez map units.



Because of their shrink-swell potential and wetness and because of their low strength, which affects roads and streets, these soils are poorly suited to most urban uses.

#### 4. Inez

*Somewhat poorly drained, very slowly permeable loamy soils*

This map unit consists of nearly level to gently sloping soils that have slopes of 0 to 2 percent. It makes up about 4 percent of the county. It is about 93 percent Inez soils and 7 percent other soils.

Inez soils typically have a surface layer of mottled, grayish brown and light brownish gray fine sandy loam about 14 inches thick. The subsoil from 14 to 80 inches is mottled, grayish brown and gray clay in the upper part and grades to mottled, light brownish gray and light gray clay loam in the lower part. These soils are slightly acid in the upper part and grade to moderately alkaline in the lower part.

Of minor extent in this map unit are Degola, Zalco, Rupley, Edna, Telferner, Nada, and Cieno soils. The deep loamy Degola soils are on flood plains of tributaries of large streams. The deep sandy Zalco soils are on flood plains of major streams. The deep sandy Rupley soils are on uplands with rounded hummocks near major tributaries of large rivers. The deep loamy Edna, Nada, and Telferner soils are on upland plains. The deep loamy Cieno soils are in slight depressions on uplands.

In most areas these soils are used as rangeland. In some areas they are used as cropland.

These soils are moderately well suited to crops. Rice and grain sorghum are the principal crops.

Native range plants are dominantly little bluestem, switchgrass, brownseed paspalum, post oak, and live oak.

Because of wetness and the shrink-swell potential, these soils are poorly suited to most urban uses.

#### 5. Faddin-Edna

*Somewhat poorly drained and poorly drained, very slowly permeable loamy soils*

This map unit consists of nearly level to gently sloping soils that have slopes of 0 to 5 percent. It makes up about 2 percent of the county. It is about 67 percent Faddin soils, 29 percent Edna soils, and 4 percent other soils.

Faddin soils typically have a surface layer of very dark grayish brown fine sandy loam about 16 inches thick. The subsoil from 16 to 80 inches is mottled, very dark gray and gray clay in the upper part and grades to grayish brown and light yellowish brown sandy clay and clay loam in the lower part. These soils are slightly acid in the upper part and grade to moderately alkaline in the lower part.

Edna soils typically have a surface layer of dark grayish brown fine sandy loam about 8 inches thick. The subsoil from 8 to 80 inches is mottled, dark gray clay in the upper part and grades to grayish brown sandy clay and then to light yellowish brown clay loam in the lower part. These soils are slightly acid in the upper part and grade to moderately alkaline in the lower part.

Of minor extent in this map unit are Lake Charles, Dacosta, Contee, and Telferner soils. These deep clayey and loamy soils are on upland plains.

In most areas these soils are used as rangeland. In a few areas they are used as cropland.

These soils are moderately well suited to crops. Grain sorghum and corn are the principal crops.

Native range plants are dominantly little bluestem, indiagrass, Florida paspalum, brownseed paspalum, Maximilian sunflower, and bundleflower.

Because of their shrink-swell potential and wetness and because of their low strength, which affects roads and streets, these soils are poorly suited to most urban uses.

#### Nearly level to gently sloping sandy, gravelly, and loamy soils on uplands

The soils in this group make up about 12 percent of the county. The main soils are Straber, Garcitas, Fordtran, Weesatche, and Papalote soils.

The surface layer is sandy, gravelly, or loamy, and the subsoil is clayey or loamy. These soils are somewhat poorly drained to well drained and are very slowly permeable to moderately permeable.

In most areas these soils are used as rangeland. The native range plants are mid and tall grasses and scattered post oak.

The soils in this group are moderately well suited to urban uses.

#### 6. Straber

*Moderately well drained, slowly permeable sandy soils*

This map unit consists of nearly level to gently sloping soils that have slopes of 0 to 5 percent. It makes up about 4 percent of the county. It is about 83 percent Straber soils and 17 percent other soils.

Straber soils typically have a surface layer of slightly acid, pale brown and very pale brown loamy fine sand about 13 inches thick. The subsoil from 13 to 46 inches is strongly acid or very strongly acid, mottled, strong brown and light gray clay in the upper part and grades to light gray sandy clay in the lower part. Below this, to a depth of 65 inches, is slightly acid, light gray sandy clay.

Of minor extent in this map unit are Denhawken, Elmendorf, Papalote, Kuy, and Rupley soils. The deep loamy Denhawken, Elmendorf, and Papalote soils are on

uplands. The deep sandy Kuy and Rupley soils are on upland sandy deposits along streams.

In most areas these soils are used as rangeland. In a few areas they are used as cropland.

Native range plants are dominantly little bluestem, switchgrass, brownseed paspalum, partridgepea, post oak, live oak, blackjack oak, and yaupon.

These soils are moderately well suited to most urban uses. The shrink-swell potential and the low strength, which affects roads and streets, are limitations to those uses.

## 7. Weesatche-Papalote

*Well drained and moderately well drained, moderately permeable and slowly permeable loamy soils*

This map unit consists of gently sloping soils that have slopes of 1 to 5 percent. It makes up about 4 percent of the county. It is about 32 percent Weesatche soils, 22 percent Papalote soils, and 46 percent other soils (fig. 3).

Weesatche soils typically have a surface layer of sandy clay loam about 13 inches thick. It is black in the upper part and very dark gray in the lower part. The subsoil to a depth of 35 inches is dark reddish brown sandy clay loam. Below the subsoil, from 35 to 60 inches, is light brown loam. These soils are neutral in the upper part and grade to moderately alkaline in the lower part.

Papalote soils typically have a surface layer of dark gray fine sandy loam about 16 inches thick. The subsoil from 16 to 45 inches is mottled, very dark grayish brown clay in the upper part and grades to mottled, brown clay in the lower part. These soils are neutral in the upper part and are moderately alkaline in the lower part.

Of minor extent in this map unit are Denhawken, Elmendorf, Goldmire, Leming, Runge, Sarnosa, Silvern, Straber, Tremona, Valco, and Zalco soils. The deep loamy Denhawken, Elmendorf, Runge, and Sarnosa soils

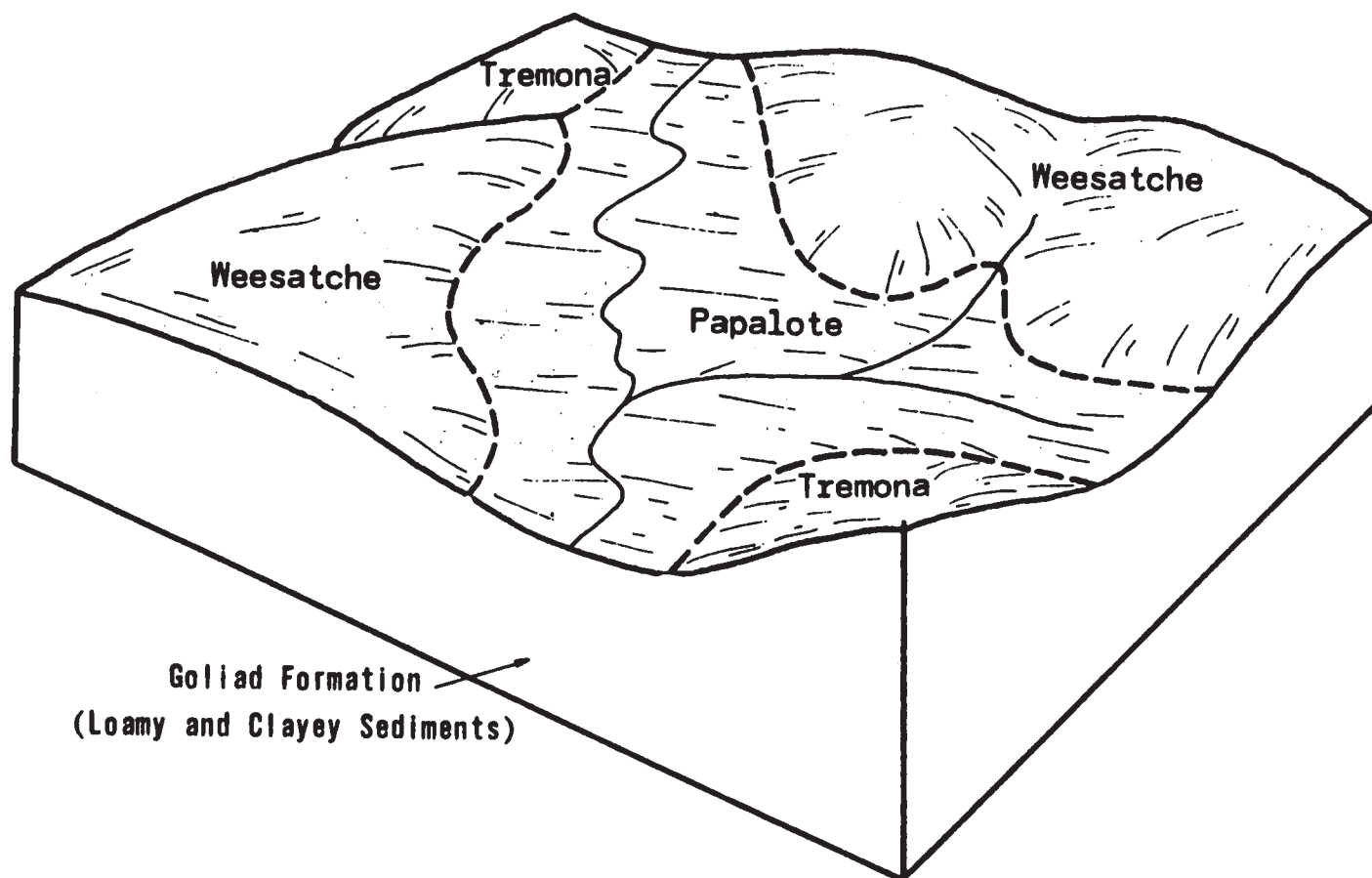


Figure 3.—Pattern of soils and underlying material in the Weesatche-Papalote map unit.

are on uplands. The deep sandy Goldmire, Leming, Silvern, Straber, and Tremona soils and the shallow loamy Valco soils are on ridges and side slopes. The deep sandy Zalco soils are on flood plains of major streams.

In most areas these soils are used as rangeland. In a few areas they are used as cropland.

These soils are moderately well suited to crops, mainly corn and grain sorghum.

Native range plants dominantly are little bluestem, silver bluestem, southwestern bristlegrass, Engelmann-daisy, bushsunflower, mesquite, condalia, and bumelia.

These soils are moderately well suited to most urban uses. Shrink-swell potential and low strength, which affects roads and streets, are limitations to those uses.

## 8. Garcitas

*Somewhat poorly drained, very slowly permeable gravelly soils*

This map unit consists of gently sloping soils that have slopes of 1 to 5 percent. It makes up about 3 percent of the county. It is about 90 percent Garcitas soils and 10 percent minor soils.

Garcitas soils typically have a surface layer about 21 inches thick that is medium acid, brown gravelly loamy fine sand in the upper part and very gravelly fine sand in the lower part. The subsoil from 21 to 29 inches is mottled, very strongly acid, light brownish gray gravelly clay; from 29 to 67 inches it is light gray clay in the upper part and grades to clay loam in the lower part. Below that, to a depth of 80 inches, is very strongly acid, light gray sandy clay loam.

Of minor extent in this map unit are Degola, Fordtran, and Telferner soils. The deep loamy Degola soils are on flood plains of tributaries of large streams. The deep sandy Fordtran soils and the deep loamy Telferner soils are on upland plains.

In most areas these soils are used as rangeland. In a few areas they are used as cropland.

Native range plants are dominantly little bluestem, switchgrass, brownseed paspalum, partridgepea, post oak, live oak, blackjack oak, and yaupon.

These soils are moderately well suited to most urban uses. Wetness and shrink-swell potential are limitations to those uses.

## 9. Fordtran

*Somewhat poorly drained, very slowly permeable sandy soils*

This map unit consists of nearly level to gently sloping soils that have slopes of 0 to 3 percent. It makes up about 1 percent of the county. It is about 96 percent Fordtran soils and 4 percent other soils.

Fordtran soils typically have a surface layer of slightly acid loamy fine sand that is dark grayish brown in the upper part and grayish brown in the lower part. The

subsoil from 37 to 70 inches is mottled, medium acid, light gray clay in the upper part and grades to mottled, light brownish gray sandy clay in the lower part.

Of minor extent in this map unit are Garcitas and Telferner soils. The deep sandy Garcitas soils are on low ridges and side slopes along drainageways. The deep loamy Telferner soils are on upland plains.

In most areas these soils are used as rangeland. In some areas they are used as cropland.

Native range plants are mostly little bluestem, indiagrass, eastern gamagrass, brownseed paspalum, and Maximilian sunflower.

These soils are moderately well suited to most urban uses. Wetness is the main limitation to those uses.

## Nearly level clayey soils on flood plains

The soils in this group make up about 12 percent of the county. The main soils are Meguin, Trinity, Rydolph, Austwell, and Aransas soils.

The surface layer is clayey, and the subsoil is clayey or loamy. These soils are well drained, somewhat poorly drained, or poorly drained, and they are moderately permeable to very slowly permeable.

In most areas these soils are used as rangeland. The native range plants are mid and tall grasses and pecan and elm trees. In some areas the soils are used as cropland. Grain sorghum and corn are the principal crops. Flooding limits the use of some areas for crops.

The soils in this group are not suited to urban uses.

## 10. Meguin-Trinity

*Well drained and somewhat poorly drained, moderately permeable and very slowly permeable clayey soils*

This map unit consists of nearly level soils that have slopes of 0 to 1 percent. It makes up about 8 percent of the county. It is about 61 percent Meguin soils, 27 percent Trinity soils, and 12 percent other soils.

Meguín soils typically have a surface layer of very dark grayish brown silty clay about 13 inches thick. The subsoil from 13 to 80 inches is silty clay loam that is grayish brown in the upper part, very dark grayish brown in the middle part, and brown in the lower part. These soils are moderately alkaline throughout.

Trinity soils typically have a surface layer of very dark gray clay about 25 inches thick. Below that, to a depth of 60 inches, is dark gray clay, and from 60 to 80 inches is gray clay. These soils are moderately alkaline throughout.

Of minor extent in this map unit are the deep Sinton, Rydolph, and Zalco soils. The loamy Sinton soils, the clayey Rydolph soils, and the sandy Zalco soils are on flood plains of major streams.

In most areas these soils are used as rangeland and cropland.

These soils are well suited to crops in areas protected from flooding. Grain sorghum and corn are the principal crops.

Native range plants are switchgrass, eastern gamagrass, indiagrass, Florida paspalum, rusty paspalum, little bluestem, snoutbean, pecan, oak, and elm.

Because of the flood hazard, these soils are not suited to urban uses.

### **11. Rydolph-Trinity**

*Somewhat poorly drained, slowly permeable and very slowly permeable clayey soils*

This map unit consists of nearly level soils that have slopes of 0 to 1 percent. It makes up about 2 percent of the county. It is about 80 percent Rydolph soils, 14 percent Trinity soils, and 6 percent other soils.

Rydolph soils typically have a surface layer of grayish brown silty clay about 9 inches thick. Below that, to a depth of 80 inches, are moderately alkaline layers of grayish and brownish loam, silty clay loam, and silt loam.

Trinity soils typically have a surface layer of very dark gray clay about 25 inches thick. Below that, to a depth of 60 inches, is dark gray clay. These soils are moderately alkaline throughout.

Of minor extent in this map unit are mainly the deep clayey Meguin soils that are on flood plains of major streams.

In most areas these soils are used as rangeland. In a few areas they are used as cropland.

These soils are well suited to crops in areas protected from flooding. Grain sorghum and corn are the principal crops.

Native range plants are dominantly eastern gamagrass, indiagrass, rustyseed paspalum, Florida

paspalum, little bluestem, snoutbean, pecan, oak, and elm.

Because of the flood hazard, these soils are not suited to urban uses.

### **12. Aransas-Austwell**

*Poorly drained, saline, very slowly permeable clayey soils*

This map unit consists of nearly level soils that have slopes of 0 to 1 percent. It makes up about 2 percent of the county. It is about 42 percent Aransas soils, 40 percent Austwell soils, and 18 percent other soils.

Aransas soils typically have a surface layer of very dark gray clay about 42 inches thick. Below that, to a depth of 60 inches, is gray clay. These soils are saline and moderately alkaline throughout.

Austwell soils typically have a surface layer of dark gray clay about 18 inches thick. The subsoil from 18 to 35 inches is mottled, dark gray clay in the upper part and grayish brown clay in the lower part. Below that, to a depth of 60 inches, is grayish silty clay loam. These soils are saline and moderately alkaline throughout.

Of minor extent in this map unit are Placedo and Trinity soils. The deep loamy Placedo soils and the deep clayey Trinity soils are on flood plains.

In most areas these soils are used as rangeland. In a few areas they are used as cropland.

These soils are poorly suited to crops because of salinity.

Native range plants are dominantly gulf cordgrass, little bluestem, bulrushes, slim aster, switchgrass, knotroot bristlegrass, and bushy sea-oxeye.

Because of the flood hazard, these soils are not suited to urban uses.





## detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Faddin fine sandy loam, 0 to 1 percent slopes, is one of several phases in the Faddin series.

Some map units are made up of two or more major soils. These map units are called soil complexes or undifferentiated groups.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Dacosta-Contee complex, 0 to 1 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils in a mapped area are not uniform. An area can be made up of only one of the major soils, or it can be

made up of all of them. Dacosta and Telferner soils, 2 to 5 percent slopes, eroded, is an undifferentiated group in this survey area.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits and Dumps is an example.

Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Rangeland is the dominant land use in this survey area. Soils that support range vegetation are assigned to a specific range site. The range site is stated for each detailed soil map unit. For a complete description of the range site, see the discussion of "Rangeland" in the section "Use and management of the soils."

### soil descriptions

**Ar—Aransas clay, frequently flooded.** This deep, nearly level soil is on wide flood plains of rivers near sea level in the southern part of the county. Areas are irregular in shape and range from 400 to 1,000 acres. The surface of most areas is marked by partly filled old stream and scour channels. The slope is plane and ranges from 0 to 1 percent.

Typically, the surface layer is moderately saline, moderately alkaline, very dark gray clay about 11 inches thick. From 11 to 30 inches is strongly saline, moderately alkaline, very dark gray clay; and from 30 to 42 inches is strongly saline, moderately alkaline, very dark gray clay. Below that, to a depth of 60 inches, is moderately saline, moderately alkaline, gray clay.

This soil is poorly drained. Permeability is very slow, and available water capacity is low. Runoff is very slow, and the hazard of water erosion is slight except in areas subject to streambank caving. The soil is flooded 1 to 3 times annually by overflow from rivers and streams. In addition, it is inundated about once a year by seawater from high storm tides. In most years, the soil is saturated for long periods and seldom dries below 12 inches. The seasonal high water table is at a depth of less than 12 inches. The salinity is moderate to strong.

Included in mapping are small areas of Austwell, Trinity, and Rydolph soils. The included soils make up less than 15 percent of any mapped area.

This Aransas soil is used as rangeland and wildlife habitat. It is in the Salt Marsh range site. It is poorly suited to crops because of flooding, poor drainage, and salinity. A few protected areas are used for grain sorghum.

This soil is not suited to most urban and recreation uses because of the flood hazard.

This soil supports habitat for a large variety and number of game birds, animals, and marine life. It supports the habitat preferred by the alligator. Nesting areas for mottled ducks, tree ducks, and wood ducks are plentiful, and thousands of migratory ducks, geese, rails, coots, and cranes frequent the habitat in fall and winter.

This soil is in capability subclass VIw.

**Au—Austwell clay, frequently flooded.** This deep, nearly level soil is on wide flood plains of major rivers in the southern part of the county. Areas are irregular in shape and range from 80 to 900 acres. The slope is plane and ranges from 0 to 1 percent.

Typically, this soil has a surface layer of moderately saline, moderately alkaline, dark gray clay about 18 inches thick. The subsoil from 18 to 35 inches is moderately saline, moderately alkaline, mottled, dark gray clay. From 35 to 42 inches the subsoil is moderately saline, moderately alkaline, mottled, grayish brown clay. From 42 to 60 inches is moderately saline, moderately alkaline silty clay loam that is light brownish gray in the upper part and grades to light gray in the lower part.

This soil is poorly drained. Permeability is very slow, and available water capacity is low. Runoff is very slow, and the hazard of water erosion is slight except in areas subject to streambank caving. The soil is inundated 2 to 4 times annually for periods of 5 to 10 days. In most years, the soil is saturated for long periods. It seldom dries below 12 inches. A high water table is within 24 inches of the surface during wet seasons. The salinity is slight to strong.

Included in mapping are small areas of Aransas, Trinity, and Rydolph soils. The included soils make up less than 10 percent of any mapped areas.

This Austwell soil is used as rangeland and wildlife habitat. It is in the Salty Prairie range site.

This soil is poorly suited to crops because of flooding, poor drainage, and salinity.

This soil is not suited to urban and recreation uses because of the flood hazard.

This soil supports habitat for dove and quail. Migratory ducks and geese frequent the habitat during fall and winter. Mottled ducks nest in some areas of rangeland, generally in lower parts near water.

This soil is in capability subclass VIw.

**DaA—Dacosta sandy clay loam, 0 to 1 percent slopes.** This deep, nearly level soil is on broad uplands. Areas are irregular in shape and range from 40 to 300 acres.

Typically, the surface layer is neutral, very dark gray sandy clay loam about 6 inches thick. The subsoil from 6 to 12 inches is neutral, very dark gray sandy clay loam. From 12 to 21 inches the subsoil is neutral, dark gray sandy clay; and from 21 to 40 inches it is dark gray clay that is neutral in the upper part and mildly alkaline in the lower part. From 40 to 78 inches the subsoil is mildly alkaline, light brownish gray sandy clay in the upper part and grades to mildly alkaline, light brownish gray sandy clay loam in the lower part. Below that, to a depth of 80 inches, is neutral, very pale brown sandy clay loam.

This soil is somewhat poorly drained. Permeability is very slow, and available water capacity is high. Runoff is very slow, and the hazard of water erosion is slight. The soil is seasonally wet and droughty and cracks when dry.

Included in mapping are small areas of Lake Charles, Edna, and Telferner soils. Telferner soils occur in slightly higher areas of 5 to 10 acres. The included soils make up less than 15 percent of a mapped area.

This Dacosta soil is used as cropland, rangeland, and pastureland. It is in the Blackland range site.

This soil is well suited to crops. Grain sorghum, corn, and rice are the principal crops. Favorable soil structure and tilth, however, are difficult to maintain in this soil. Surface crusts and plowpans are common in cultivated fields. Good management includes leaving residue on the surface when crops are not grown, timely and limited tillage, and crop rotation. Incorporating crop residue into the soil helps maintain favorable soil structure, tilth, and water intake. In some places, excess water can be removed by planning row and furrow direction (fig. 4). Fertilizer is needed for maximum crop production. Drainage ditches are beneficial if adequate outlets are available.

This soil is well suited to improved pastures of Gordo bluestem and kleingrass.

This soil is poorly suited to most urban and recreation uses. The main limitations to those uses are the shrink-swell potential, wetness, and very slow permeability. Most of these limitations can be overcome by good design and careful installation.

This soil supports habitat for dove and quail. The Attwater prairie chicken is in a few well managed areas





Figure 4.—Furrows between the rows of grain sorghum on Dacosta sandy clay loam, 0 to 1 percent slopes, help to remove excess water.

of rangeland. Mottled ducks nest in some areas of rangeland, generally in lower parts near water.

This soil is in capability subclass IIIw.

**DaB—Dacosta sandy clay loam, 1 to 3 percent slopes.** This deep, gently sloping soil is on long, narrow upland areas along drainageways. Areas are oblong and range from 20 to 60 acres.

Typically, the surface layer is neutral, very dark gray sandy clay loam about 9 inches thick. The subsoil from 9 to 31 inches is mildly alkaline, black clay. Between depths of 31 and 41 inches the subsoil is moderately alkaline, dark gray clay. The lower part of the subsoil to a depth of 80 inches is moderately alkaline, light gray clay loam.

The soil is somewhat poorly drained. Permeability is very slow, and available water capacity is high. Runoff is medium, and the hazard of water erosion is slight. The soil is seasonally wet and droughty. It cracks when dry.

Included in mapping are small areas of Lake Charles, Edna, and Telferner soils, which make up less than 20 percent of a mapped area. Lake Charles and Edna soils are on landscape positions similar to those of Dacosta soils. Telferner soils are in slightly higher areas of 5 to 10 acres.

This Dacosta soil is used as cropland, rangeland, and pastureland. It is in the Blackland range site.

This soil is well suited to crops. Grain sorghum and corn are the principal crops. Favorable soil structure and tilth, however, are difficult to maintain in this soil. Surface crusts and plowpans are common in cultivated fields.

Good management includes leaving residue on the surface when crops are not grown, timely and limited tillage, and crop rotation. Incorporating crop residue into the soil also helps maintain favorable soil structure, tilth, and water intake. Terraces and stable outlets are needed if row crops are grown. Fertilizer is needed for maximum crop production.

This soil is well suited to improved pastures of Gordo bluestem and kleingrass.

This soil is poorly suited to most urban and recreation uses. The main limitations are shrink-swell potential, wetness, and very slow permeability. Most of the limitations can be overcome by good design and careful installation.

This soil supports habitat for dove and quail. The Attwater prairie chicken is in a few well managed areas of rangeland. Mottled ducks nest in some areas of rangeland, generally in lower parts near water.

This soil is in capability subclass IIIe.

**DnA—Dacosta-Contee complex, 0 to 1 percent slopes.** This complex of nearly level soils is on broad extensive uplands. Areas range from 20 to 300 acres.

The Dacosta soils make up 50 to 80 percent of this complex, commonly about 60 percent. The Contee soils make up 15 to 50 percent, commonly about 30 percent. Other soils make up 5 to 15 percent of this complex. Areas of these soils are so intricately mixed that mapping them separately is not practical at the scale used.

In undisturbed areas, the microrelief is one of knolls and depressions that occur in a repeating pattern. The



Dacosta soils are in the depressions, which are 5 to 10 inches lower than the knolls. The depressions are irregular to oblong in shape and are 5 to 20 feet wide and 18 to 53 feet long. They commonly are interconnected. The Contee soils are on the knolls, which are irregular and oblong and 4 to 18 feet wide and 10 to 28 feet long.

Typically, the Dacosta soils have a surface layer of slightly acid, black clay loam about 11 inches thick. The subsoil from 11 to 36 inches is neutral, black clay. From 36 to 50 inches the subsoil is moderately alkaline, dark gray clay; and from 50 to 80 inches it is moderately alkaline, light gray clay.

Typically, the Contee soils have a surface layer of moderately alkaline, very dark gray clay loam about 9 inches thick. The subsoil from 9 to 15 inches is moderately alkaline, dark gray clay. The lower part of the subsoil, from 15 to 56 inches, is moderately alkaline, light brownish gray clay. Below the subsoil, to a depth of 80 inches, is moderately alkaline, light yellowish brown clay.

These soils are somewhat poorly drained. Permeability is very slow, and the available water capacity is high. When the soils are dry, they crack. Water enters the soil rapidly until the cracks swell shut; then it enters very slowly. Runoff is very slow, and the hazard of water erosion is slight.

Included in mapping are areas of Lake Charles clay and small spots of Edna, Telferner, and Faddin soils along soil boundaries. The included soils make up 5 to 15 percent of most mapped areas.

The Dacosta and Contee soils are used as cropland, rangeland, and pastureland. They are in the Blackland range site.

These soils are well suited to crops. Grain sorghum and corn are the chief crops. Favorable soil structure and tilth are difficult to maintain, however, and the moisture range in which the soils can be cultivated is narrow. Surface crusts and plowpans are common in cultivated fields. In large, nearly level areas, runoff is very slow, and water collects on the surface after heavy rains. Good management includes leaving crop residue on the surface when crops are not grown, timely and limited tillage, and crop rotation. Incorporating crop residue into the soil helps maintain favorable soil structure, tilth, and water intake. In some places, rows can be laid out to remove excess surface water. Fertilizer is needed for maximum crop production. Drainage ditches are beneficial if adequate outlets are available.

These soils are well suited to improved pasture of Gordo bluestem and kleingrass.

These soils are poorly suited to most urban and recreation uses. The main limitations are shrink-swell potential, wetness, and very slow permeability. Most of the limitations can be overcome by good design and careful installation.

These soils support habitat for dove and quail. The Attwater prairie chicken is in a few well managed areas of rangeland. Mottled ducks nest in some areas of rangeland, generally in lower parts near water.

The soils in this complex are in capability subclass IIIw.

**DuB—Dacosta-Urban land complex, 0 to 3 percent slopes.** This nearly level to gently sloping complex is in urban areas on broad uplands. The areas are irregular in shape and range from 30 to 200 acres. The slope is mainly 0 to 1 percent but ranges up to 3 percent near drainageways.

Dacosta soils make up 50 to 65 percent of the complex, commonly about 60 percent. Urban land makes up about 15 to 35 percent of the complex, commonly about 25 percent. The included soils make up about 15 percent. The areas of Dacosta soils and areas of Urban land are so intricately mixed that mapping them separately is not practical at the scale used.

The Dacosta soils make up vacant lots, yards, and other open areas. Typically, the surface layer of the Dacosta soils is slightly acid, very dark gray sandy clay loam about 6 inches thick. The subsoil from 6 to 12 inches is slightly acid, very dark gray sandy clay loam. From 12 to 21 inches the subsoil is slightly acid, dark gray sandy clay; and from 21 to 40 inches it is dark gray clay that is neutral in the upper part and moderately alkaline in the lower part. From 40 to 78 inches the subsoil is mildly alkaline, light brownish gray sandy clay in the upper part and grades to mildly alkaline, light brownish gray sandy clay in the lower part. Below the subsoil, to a depth of 80 inches, is neutral, very pale brown sandy clay loam.

These soils are somewhat poorly drained. Permeability is very slow, and available water capacity is high. Runoff is slow, and the hazard of water erosion is slight.

The areas of Urban land, originally areas of Dacosta soils, are covered by buildings or other urban structures, including single- and multiple-unit dwellings, streets, driveways, schools, churches, parking lots, office buildings, industrial sites, and shopping centers that are less than 20 acres.

Included in mapping are small areas of Lake Charles, Telferner, and Edna soils. Also included are remnants of the Dacosta soils where the upper parts have been altered by cutting, filling, and grading during construction. The included soils make up less than 15 percent of any mapped area.

The Dacosta soils are poorly suited to most urban uses. The shrink-swell potential and wetness are the main limitations to building and road development. The risk of corrosion to uncoated steel is high. The soils are poorly suited to most recreation uses because of their clayey texture and wetness during winter and spring. Their suitability for landscape plantings and gardens is also poor. Most of the limitations to urban uses,

however, can be overcome by good design and careful installation.

The soils in this complex are not assigned to a capability subclass or a range site.

**DvC—Dacosta and Telferner soils, 2 to 5 percent slopes, eroded.** These deep, gently sloping, eroded soils are in narrow strips along creeks and drainageways on uplands. The slopes are slightly concave and average about 4 percent. A few short gullies 2 to 10 feet wide and 0.5 foot to 2 feet deep dissect these soils at intervals of about 75 to 300 feet. Some of the soils have lost part or most of their original surface layer through erosion. Erosion ranges from moderate sheet to severe sheet and gully. Areas range from 20 to 400 acres.

The Dacosta soils make up about 45 percent of this map unit, Telferner soils 30 percent, and other soils 25 percent. The pattern and proportion of these soils in a mapped area are not uniform. Most areas of this map unit contain soils of both series, but a few areas contain only soils of one series. The composition of this map unit is more variable than that of others in the county. Mapping has been controlled well enough, however, for the expected uses of the soils.

Typically, the Dacosta soils have a surface layer of mildly alkaline, very dark gray sandy clay loam about 2 inches thick. From 2 to 18 inches is moderately alkaline, very dark gray clay. The upper part of the subsoil, between depths of 18 and 48 inches, is moderately alkaline, gray clay; and the lower part, between depths of 48 and 80 inches, is moderately alkaline, mottled, gray clay.

These soils are somewhat poorly drained. Permeability is very slow, and available water capacity is high. Runoff is medium, and the hazard of water erosion is severe.

Typically, the Telferner soils have a surface layer of slightly acid, dark grayish brown fine sandy loam about 16 inches thick. The subsoil from 16 to 20 inches is slightly acid, mottled dark gray clay. From 20 to 52 inches, the subsoil is slightly acid, mottled sandy clay that is gray in the upper part and light gray in the lower part. Below that, to a depth of 80 inches, is moderately alkaline, mottled, gray clay.

These soils are somewhat poorly drained. Permeability is very slow, and available water capacity is medium. Runoff is slow, and the hazard of water erosion is severe. The soils have a perched water table in the subsoil during rainy periods.

Included in mapping are small areas of Edna and Lake Charles soils. The included soils make up less than 25 percent of any mapped area.

The Dacosta and Telferner soils are used as rangeland. The Dacosta soils are in the Blackland range site. The Telferner soils are in the Loamy Prairie range site.

These soils are poorly suited to most urban and recreation uses. The main limitations to those uses are

the shrink-swell potential and wetness. Most of the limitations to urban uses, however, can be overcome by good design and careful installation.

These soils support habitat for dove and quail. The Attwater prairie chicken is in a few well managed areas of rangeland. Mottled ducks nest in some areas of rangeland, generally lower parts near water.

The soils in this complex are in capability subclass IIIe.

**Dw—Degola sandy clay loam, frequently flooded.**

This deep, nearly level soil is on flood plains of tributaries of large streams. Areas are long and narrow and range from 20 to 200 acres. The slope range is 0 to 1 percent.

Typically, the surface layer is slightly acid, very dark gray sandy clay loam about 20 inches thick. From 20 to 25 inches is calcareous, moderately alkaline, very dark grayish brown sandy clay loam. Below that, to a depth of 60 inches, is calcareous, moderately alkaline, light brownish gray sandy clay loam.

This soil is well drained. Permeability is moderate, and available water capacity is high. Runoff is slow, and the hazard of water erosion is slight except in areas subject to streambank caving. Areas are flooded 1 to 4 times annually for a period of 1 to 5 days.

Included in mapping are small areas of soils that are similar to the Degola soil but have a thin, dark surface layer. A few small areas of sandier soils are also included. The included soils make up less than 10 percent of any mapped area.

This Degola soil is used mainly as rangeland. It is in the Loamy Bottomland range site.

This soil is poorly suited to crops because of the flood hazard. It is well suited to improved pasture of bermudagrass and kleingrass.

This soil is not suited to most urban and recreation uses because of the flood hazard.

This soil supports habitat for deer, duck, squirrel, swamp rabbit, and other furbearing animals. Nesting areas for quail, dove, and songbirds are plentiful.

This soil is in capability subclass Vw.

**DxB—Denhawken-Elmendorf complex, 0 to 2 percent slopes.** This complex of nearly level to gently sloping soils is on uplands. Areas are oblong and range from 30 to 70 acres.

The Denhawken soils make up 52 to 58 percent of this complex, commonly about 55 percent. The Elmendorf soils make up 42 to 48 percent, commonly about 45 percent. Other soils make up 0 to 5 percent of this complex. Areas of these soils are so intricately mixed that mapping them separately is not practical at the scale used.

In undisturbed areas, the microrelief is one of knolls and depressions that occur in a repeating pattern. The Denhawken soils are on the knolls, which are irregular to oblong in shape and are 10 to 20 feet wide and 20 to 55



feet long. The Elmendorf soils are in the depressions, which are 5 to 10 inches lower than the knolls. The depressions are irregular to oblong and 5 to 15 feet wide and 10 to 30 feet long.

Typically, the Denhawken soils have a surface layer of calcareous, moderately alkaline, very dark grayish brown clay loam about 5 inches thick. The upper part of the subsoil, from 5 to 27 inches, is calcareous, moderately alkaline grayish brown clay; the lower part, from 27 to 53 inches, is calcareous, moderately alkaline, grayish brown clay. Below that, to a depth of 73 inches, is calcareous, moderately alkaline, reddish yellow clay.

Typically, the Elmendorf soils have a surface layer of neutral, black clay loam about 11 inches thick. The subsoil from 11 to 19 inches is neutral, black clay. From 19 to 33 inches the subsoil is moderately alkaline, black clay; from 33 to 49 inches it is calcareous, moderately alkaline, dark gray clay; and from 49 to 60 inches it is

calcareous, moderately alkaline, light brownish gray clay. Below the subsoil, to a depth of 80 inches, is calcareous, moderately alkaline, yellowish red clay that has brownish mottles.

These soils are well drained. Permeability is very slow, and available water capacity is high. When the soils are dry, they crack. Water enters them rapidly until the cracks swell shut; then it enters very slowly. Runoff is slow, and the hazard of water erosion is slight.

Included in mapping are a few areas of Weesatche, Sarnosa, and Papalote soils on the outer edge of the mapped areas. The included soils make up less than 5 percent of any mapped area.

The Denhawken and Elmendorf soils are used as cropland, rangeland (fig. 5), and pastureland. They are in the Rolling Blackland range site.

These soils are moderately well suited to crops. Grain sorghum and corn are the principal crops. Favorable soil



*Figure 5.—This Rolling Blackland range site is in an area of Denhawken-Elmendorf complex, 0 to 2 percent slopes.*



structure and tilth, however, are difficult to maintain in these soils, and the moisture range in which the soils can be cultivated is narrow. Surface crusts and plowpans are common in cultivated fields. Good management includes leaving crop residue on the surface when crops are not grown, timely and limited tillage, and crop rotation. Incorporating crop residue into the soil also helps maintain favorable soil structure, tilth, and water intake. Fertilizers increase yields.

These soils are well suited to improved pastures of Gordo bluestem and kleingrass.

These soils are poorly suited to most urban uses and are moderately well suited to recreation uses. The main limitations to those uses are the shrink-swell potential and the very slow permeability. Most of the limitations can be overcome by good design and careful installation.

These soils support habitat for dove and quail. Nesting areas for songbirds are plentiful.

The soils in this complex are in capability subclass IIs.

**EdA—Edna fine sandy loam, 0 to 1 percent slopes.**

This deep, nearly level soil is on broad uplands. Areas are irregular in shape and range from 20 to 500 acres.

Typically, the surface layer is dark grayish brown fine sandy loam about 8 inches thick. The upper part of the subsoil, from 8 to 18 inches, is mottled, dark gray clay. The lower part, from 18 to 80 inches, is clay loam that is gray in the upper part and grades to light gray in the lower part. This soil is slightly acid in the upper part and grades to moderately alkaline and calcareous in the lower part.

This soil is poorly drained. Permeability is very slow, and available water capacity is high. Runoff is very slow, and the hazard of water erosion is slight. A perched water table is at a depth of 0 to 1.5 feet during rainy seasons. The soil is seasonally wet and droughty and cracks when dry.

Included in mapping are small areas of Dacosta, Fordtran, Faddin, and Telferner soils. The included soils make up less than 20 percent of any mapped area.

This Edna soil is used as rangeland and cropland. It is in the Claypan Prairie range site.

This soil is moderately well suited to crops. Rice, grain sorghum, and corn are the principal crops. Low fertility and droughtiness limit crop production. In some large areas, runoff is very slow, and water collects on the surface during rainy periods. Good management includes leaving residue on the surface when crops are not grown, timely and limited tillage, and crop rotation. Fertilizer is needed for maximum crop production. Drainage ditches are beneficial if adequate outlets are available.

This soil is moderately well suited to improved pastures of bermudagrass and Gordo bluestem.

This soil supports habitat for dove and quail. The Attwater prairie chicken is in a few well managed areas

of rangeland. Mottled ducks nest in some areas of rangeland, generally in lower parts near water.

This soil is in capability subclass IIIw.

**EdB—Edna fine sandy loam, 1 to 3 percent slopes.**

This deep, gently sloping soil is on side slopes along drainageways. Areas are oval and oblong and range from 30 to 90 acres.

Typically, the surface layer is very dark grayish brown fine sandy loam about 9 inches thick. The subsoil from 9 to 49 inches is mottled, gray clay loam. Below that, to a depth of 80 inches, is calcareous, moderately alkaline, mottled, white clay. This soil is slightly acid in the upper part and grades to moderately alkaline and calcareous in the lower part.

This soil is poorly drained. Permeability is very slow, and available water capacity is high. Runoff is very slow, and the hazard of water erosion is moderate. A perched water table is at a depth of 0 to 1.5 feet during rainy seasons. The soil is seasonally wet and droughty. It cracks when dry.

Included in mapping are small areas of Telferner and Dacosta soils. The included soils make up less than 10 percent of any mapped area.

This Edna soil is used as cropland, rangeland, and pastureland. It is in the Claypan Prairie range site.

This soil is moderately well suited to crops. Grain sorghum and corn are the principal crops. Low fertility and droughtiness limit crop production. Good management includes leaving residue on the surface when crops are not grown, timely and limited tillage, and crop rotation. Terraces and stable outlets are needed where row crops are grown. Fertilizer is needed for maximum crop production.

This soil is moderately well suited to improved pastures of bermudagrass and Gordo bluestem.

This soil is poorly suited to most urban and recreation uses. The main limitations are the shrink-swell potential, very slow permeability, and wetness. Most limitations can be overcome by good design and careful installation.

This soil supports habitat for dove and quail. The Attwater prairie chicken is in a few well managed areas of rangeland. Mottled ducks nest in some areas of rangeland, generally in lower parts near water.

This soil is in capability subclass IIIe.

**FaA—Faddin fine sandy loam, 0 to 1 percent slopes.** This deep, nearly level soil is on broad uplands. Areas are irregular in shape and range from 50 to 400 acres.

Typically, the surface layer is slightly acid, very dark grayish brown fine sandy loam about 16 inches thick. The subsoil from 16 to 24 inches is neutral, mottled, very dark gray clay. From 24 to 35 inches the subsoil is neutral, mottled, gray clay; from 35 to 46 inches it is calcareous, moderately alkaline, grayish brown sandy clay; and from 46 to 80 inches it is calcareous,



moderately alkaline, light yellowish brown clay loam. In some places the surface layer is very fine sandy loam.

This soil is somewhat poorly drained. Permeability is very slow, and available water capacity is high. This soil has good tilth and can be worked throughout a wide range of moisture conditions. Runoff is slow, and the hazard of water erosion is slight. A perched water table is at a depth of 1.0 to 1.5 feet during rainy seasons.

Included in mapping are small areas of Edna, Telferner, and Dacosta soils. The included soils make up less than 15 percent of any mapped area.

This Faddin soil is used as cropland and rangeland. It is in the Loamy Prairie range site.

This soil is moderately well suited to crops. Grain sorghum and corn are the principal crops. Good management includes leaving residue on the surface when crops are not grown, timely and limited tillage, and crop rotation. Fertilizer is needed for maximum crop production.

This soil is well suited to improved pastures of kleingrass and Pensacola bahiagrass.

This soil is poorly suited to most urban and recreation uses. The main limitations are the shrink-swell potential, wetness, and very slow permeability. Most of the limitations can be overcome by good design and careful installation.

This soil supports habitat for dove and quail. The Attwater prairie chicken is in a few well managed areas of rangeland. Mottled ducks nest in some areas of rangeland, generally in lower parts near water.

This soil is in capability subclass IIw.

#### **FaB—Faddin fine sandy loam, 1 to 3 percent**

**slopes.** This deep, gently sloping soil is on low ridges and side slopes along drainageways. Areas are mostly long and narrow and range from 30 to 100 acres.

Typically, the surface layer is slightly acid, black fine sandy loam about 16 inches thick. The subsoil from 16 to 26 inches is slightly acid, mottled, black clay. From 26 to 34 inches the subsoil is neutral, mottled, light brownish gray clay; from 34 to 39 inches it is noncalcareous, moderately alkaline, mottled, grayish brown clay; and from 39 to 60 inches it is firm, calcareous, moderately alkaline, mottled, light yellowish brown clay loam.

This soil is somewhat poorly drained. Permeability is very slow, and available water capacity is high. This soil has good tilth and can be worked throughout a wide range of moisture conditions. Surface runoff is slow, and the hazard of water erosion is moderate. A perched water table is at a depth of 1.0 to 1.5 feet during rainy seasons.

Included in mapping are small areas of Edna, Telferner, and Dacosta soils. The included soils make up less than 20 percent of any mapped area.

This Faddin soil is used as rangeland. It is in the Loamy Prairie range site.

This soil is moderately well suited to crops. Grain sorghum and corn are the principal crops. Good management includes leaving residue on the surface when crops are not grown, timely and limited tillage, and crop rotation. Fertilizer is needed for maximum crop production.

This soil is well suited to improved pastures of kleingrass and Pensacola bahiagrass.

This soil is poorly suited to most urban and recreation uses. The main limitations are the shrink-swell potential, wetness, and very slow permeability. Most of the limitations can be overcome by good design and careful installation.

This soil supports habitat for dove and quail. The Attwater prairie chicken is in a few well managed areas of rangeland. Mottled ducks nest in some areas of rangeland, generally in lower parts near water.

This soil is in capability subclass IIe.

#### **FaC—Faddin fine sandy loam, 3 to 5 percent**

**slopes.** This deep, gently sloping soil is on low ridges and side slopes along drainageways. Areas are narrow and oblong in shape and range from 30 to 70 acres.

Typically, the surface layer is slightly acid, very dark brown fine sandy loam about 14 inches thick. The subsoil from 14 to 25 inches is slightly acid, mottled, very dark gray sandy clay. From 25 to 34 inches the subsoil is moderately alkaline, mottled, gray clay; from 34 to 44 inches it is moderately alkaline, mottled, pale brown clay; and from 44 to 45 inches it is moderately alkaline, mottled, light yellowish brown clay loam. The subsoil to a depth of 60 inches is calcareous, moderately alkaline, mottled clay loam.

This soil is somewhat poorly drained. Permeability is very slow, and available water capacity is high. Surface runoff is medium, and the hazard of water erosion is severe. A perched water table is at a depth of 1.0 to 1.5 feet during rainy seasons.

Included in mapping are small areas of Edna, Telferner, Runge, and Dacosta soils. The included soils make up less than 25 percent of any mapped area.

This Faddin soil is used as rangeland. It is in the Loamy Prairie range site.

This soil is moderately well suited to crops. Corn and grain sorghum are suited. Good management includes leaving residue on the surface when crops are not grown, timely and limited tillage, and crop rotation. Contour farming and terraces are needed to prevent erosion. Fertilizer is needed for maximum crop production.

This soil is well suited to improved pastures of kleingrass and Pensacola bahiagrass.

This soil is poorly suited to most urban and recreation uses. The main limitations are the shrink-swell potential, wetness, slope, and very slow permeability; however, most of the limitations can be overcome by good design and careful installation.

This soil supports habitat for dove and quail. The Attwater prairie chicken is in a few well managed areas of rangeland. Mottled ducks nest in some areas of rangeland, generally in lower parts near water.

This soil is in capability subclass IIIe.

**FoB—Fordtran loamy fine sand, 0 to 3 percent slopes.** This deep, nearly level to gently sloping soil is on broad uplands. Areas are irregular in shape and range from 30 to 400 acres.

Typically, the surface layer is slightly acid, dark grayish brown loamy fine sand about 28 inches thick. From 28 to 37 inches is slightly acid, grayish brown loamy fine sand. The subsoil from 37 to 55 inches is medium acid, mottled, light gray clay. The lower part of the subsoil to a depth of 70 inches is medium acid, mottled, light brownish gray sandy clay.

This soil is somewhat poorly drained. Permeability is very slow, and available water capacity is medium. This soil has good tilth and can be worked throughout a wide range of moisture conditions. Runoff is slow, and the hazard of water erosion is slight. A perched water table is at a depth of 1.0 to 3.5 feet during rainy seasons. The soil is seasonally wet and droughty.

Included in mapping are small areas of Telferner, Kuy, and Faddin soils. Also included are areas of Nada and Cieno soils that are 10 to 20 acres. The included soils make up less than 25 percent of any mapped area.

This Fordtran soil is used as rangeland and pastureland. It is in the Sandy Prairie range site.

This soil is moderately well suited to improved pastures of kleingrass and Pensacola bahiagrass.

This soil is moderately well suited to most urban and recreation uses. The main limitations are the very slow permeability and wetness. These limitations can generally be overcome by good design and careful installation.

This soil supports habitat for dove and quail. The Attwater prairie chicken is in a few well managed areas of rangeland.

This soil is in capability subclass IIIw.

**GaC—Garcitas gravelly loamy fine sand, 1 to 5 percent slopes.** This deep, gently sloping soil is on low ridges and side slopes along drainageways. Areas are irregular and oblong and range from 50 to 800 acres.

Typically, the surface layer, about 21 inches thick, is medium acid, brown gravelly loamy fine sand in the upper part and grades to medium acid, brown very gravelly fine sand in the lower part. The subsoil from 21 to 29 inches is very strongly acid, mottled, light brownish gray gravelly clay. From 29 to 67 inches the subsoil is very strongly acid, mottled, light gray clay and grades to clay loam in the lower part. Below that, to a depth of 80 inches, is very strongly acid, mottled, light gray sandy clay loam.

This soil is somewhat poorly drained. Permeability is very slow, and available water capacity is low. This soil is difficult to till because of the gravel. Surface runoff is slow, and the hazard of water erosion is slight. A perched water table is at a depth of 1.5 to 3.5 feet during rainy seasons.

Included in mapping are small areas of Fordtran, Telferner, Nada, and Cieno soils, which make up less than 25 percent of any mapped area. Soils that are similar to the Garcitas soil except that they have more than 35 percent gravel in the B2t horizon make up to 40 percent of some mapped areas.

This Garcitas soil is used as rangeland. It is in the Sandy Loam range site.

This soil is moderately well suited to most urban and recreation uses. The main limitations are the very slow permeability, the shrink-swell potential of the subsoil, and wetness. Most of the limitations can be overcome by good design and careful installation.

This soil supports habitat for dove and quail.

This soil is in capability subclass IVs.

**GdC—Goldmire very gravelly loamy fine sand, 1 to 5 percent slopes.** This deep, gently sloping gravelly soil is on ridges and hilltops of dissected uplands. In most areas, the surface layer of this soil has been stripped or removed for gravel. Areas are rectangular or oblong and range from 20 to 90 acres.

Typically, the surface layer is medium acid, brown very gravelly loamy fine sand about 3 inches thick. The upper part of the subsoil, from 3 to 14 inches, is very strongly acid, mottled, pinkish gray very gravelly sandy clay loam. The lower part, from 14 to 49 inches, is very strongly acid, mottled, light gray very gravelly sandy clay loam. From 49 to 63 inches is strongly acid, light gray sandy clay loam. Below that, to a depth of 80 inches, is strongly acid, light gray, weakly cemented very gravelly sandy clay loam.

This soil is moderately well drained. Permeability is moderately slow, and available water capacity is low. Runoff is slow, and the hazard of water erosion is slight. This soil is difficult to till because of the gravel.

Included in mapping are small areas of Silvern and Tremona soils, which make up less than 10 percent of any mapped area. Also included are soils that are similar to the Goldmire soil but have slightly weathered, light-colored sediments at a depth of less than 40 inches. These soils are commonly in the middle of the surface-mined areas and make up 20 to 30 percent of some mapped areas. Scattered outcrops of shale, weakly cemented sandstone, or weakly cemented sandstone conglomerate are in most mapped areas. These spots are 10 to 40 feet wide.

This Goldmire soil is used as rangeland. It is in the Gravelly range site. It is not suited to crops because of gravel and slope.



This soil is well suited to most urban uses. It is limited mainly by the gravelly surface layer. It is poorly suited to recreation uses because of the gravelly surface layer. Most limitations to urban uses can be overcome by good design and careful installation.

This soil supports habitat for deer, dove, and quail. Wildlife from adjacent bottom lands and small streams often feed on the site. The habitat has ample cover for wildlife and produces adequate browse, mast, forbs, and seeds for a year-round food supply.

This soil is in capability subclass VIs.

**InB—Inez fine sandy loam, 0 to 2 percent slopes.**

This deep, nearly level to gently sloping soil is on broad uplands bordering major streams. Areas range from 30 to 1,000 acres.

Typically, the surface layer is mottled, light grayish brown fine sandy loam about 8 inches thick. From 8 to 14 inches is mottled, light brownish gray fine sandy loam. The subsoil from 14 to 49 inches is mottled clay that is grayish brown in the upper part and gray in the lower part. The lower part of the subsoil to a depth of 80 inches is moderately alkaline, mottled, light brownish gray clay loam that grades to light gray. This soil is slightly to strongly acid in the upper part and grades to moderately alkaline in the lower part.

This soil is somewhat poorly drained. Permeability is very slow, and available water capacity is high. This soil has good tilth and can be worked throughout a wide range of moisture conditions. Runoff is slow, and the hazard of water erosion is slight. A perched water table is at a depth of 0 to 1.5 feet during rainy seasons.

Included in mapping are small areas of Telferner and Dacosta soils. The included soils make up less than 15 percent of any mapped area.

This Inez soil is used as rangeland, cropland, and pastureland. It is in the Sandy Loam range site.

This soil is moderately well suited to crops. Rice, grain sorghum, and corn are the main crops. Good management includes leaving residue on the surface when crops are not grown, timely and limited tillage, and crop rotation. Incorporating crop residue into the soil helps control erosion and maintain productivity and tilth. Fertilizer is needed for maximum crop production. Drainage ditches are beneficial if adequate outlets are available.

This soil is moderately well suited to improved pastures of kleingrass and Pensacola bahiagrass.

This soil is poorly suited to most urban and recreation uses. It is limited mainly by wetness, shrink-swell potential, and very slow permeability. Most of the limitations can be overcome by good design and careful installation.

This soil supports habitat for deer, dove, turkey, quail, and squirrel. The habitat has ample cover and enough browse, mast, seeds, and tender grazing for a year-round food supply.

This soil is in capability subclass IIIw.

**KyC—Kuy loamy sand, 0 to 5 percent slopes.** This deep, nearly level to gently sloping soil is on upland terraces along streams. Areas are oval and range from 20 to 1,000 acres.

Typically, the surface layer is slightly acid, light brownish gray loamy sand about 6 inches thick. From 6 to 40 inches is slightly acid, light gray loamy sand, and from 40 to 51 inches is mildly alkaline, white loamy sand. The subsoil to a depth of 80 inches is strongly acid, mottled, light gray sandy clay loam.

This soil is moderately well drained. Permeability is moderate, and available water capacity is low. Surface runoff is very slow, and the hazard of water erosion is slight. A perched water table is at a depth of 3 to 5 feet during rainy seasons.

Included in mapping are small areas of Fordtran, Rupley, and Telferner soils. The included soils make up less than 20 percent of any mapped area.

This Kuy soil is used as rangeland and pastureland. It is in the Deep Sand range site.

This soil is moderately well suited to improved pastures of lovegrass and Pensacola bahiagrass.

This soil is well suited to most urban and recreation uses.

This soil supports habitat for deer, dove, quail, and squirrel. The habitat has ample cover and enough browse, mast, forbs, and seeds to supply food the year round.

This soil is in capability subclass IIIs.

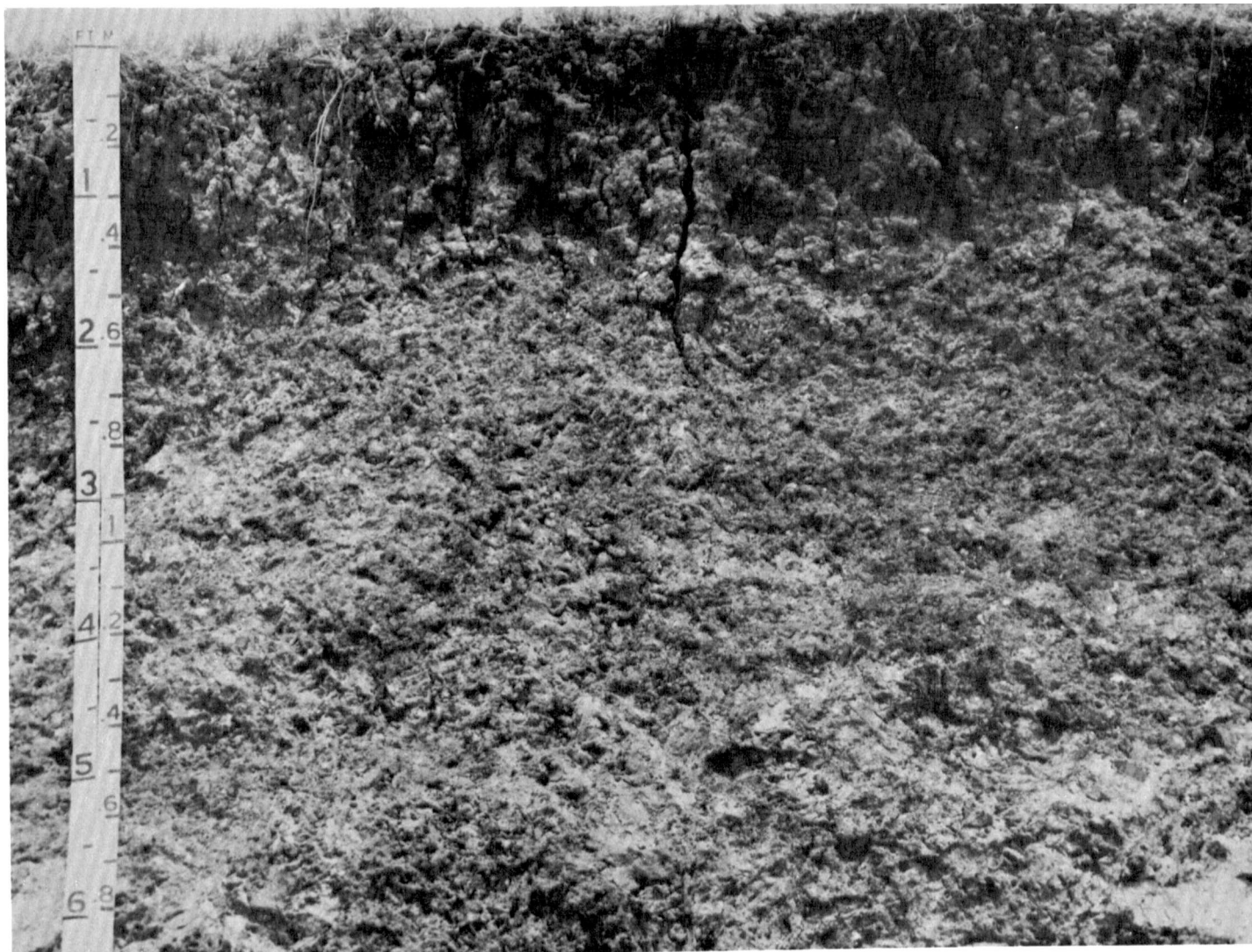
**LaA—Lake Charles clay, 0 to 1 percent slopes.** This deep, nearly level soil is on broad upland areas that are up to 3,000 acres in size. In undisturbed areas, the surface is characterized by gilgai microrelief consisting of knolls and depressions. Evidence of gilgai microrelief is destroyed after a few years of cultivation.

In the center of a microdepression, typically, the surface layer is about 46 inches thick. In the upper 23 inches it is neutral, black clay, and in the lower 23 inches it is moderately alkaline, very dark gray clay. From 46 to 54 inches is moderately alkaline, dark gray clay. Below that, to a depth of 80 inches, is moderately alkaline, mottled, very pale brown clay.

This soil is somewhat poorly drained. Permeability is very slow, and available water capacity is high. When this soil is dry, deep wide cracks form to the surface (fig. 6). Water enters the soil rapidly when the soil is cracked and very slowly when the soil is wet and the cracks are closed. Runoff is very slow, and the hazard of water erosion is slight. This soil is saturated at times during winter, and a few areas may be ponded.

Included in mapping are small areas of Dacosta and Contee soils. The included soils make up less than 10 percent of any mapped area.





*Figure 6.—Profile of Lake Charles clay, 0 to 1 percent slopes. Wide, deep cracks are in the upper layers, and intersecting slickensides are in the lower layers.*

This Lake Charles soil is used as cropland, pastureland, and rangeland. It is in the Blackland range site.

This soil is well suited to crops. Grain sorghum, rice, corn, and cotton are the main crops. Favorable soil structure and tilth, however, are difficult to maintain, and the moisture range in which the soil can be cultivated is narrow. Surface crusts and plowpans are common in cultivated fields. In large areas, runoff is very slow and excess water collects on the surface during rainy periods. Good management includes leaving crop residue on the surface when crops are not grown, timely and limited tillage, and crop rotation. Incorporating crop residue into the soil also helps maintain favorable soil structure and tilth and water intake. In some places,

rows can be laid out in such a way as to remove excess surface water. Fertilizer is needed to increase yields. Drainage is also needed in most areas.

This soil is well suited to improved pastures of bermudagrass and Gordo bluestem.

This soil is poorly suited to most urban and recreation uses. The main limitation to these uses are the shrink-swell potential, wetness, and clayey texture. Most of the limitations can be overcome by good design and careful installation.

This soil supports habitat for dove and quail. The Attwater prairie chicken is in a few well managed areas of rangeland. Mottled ducks nest in some areas of rangeland, generally in lower parts near water.

This soil is in capability subclass IIw.



**LaB—Lake Charles clay, 1 to 3 percent slopes.** This deep, gently sloping soil is along low ridges and natural drainageways. Areas are commonly oblong and range from 50 to 200 acres.

In undisturbed areas, the surface is characterized by gilgai microrelief consisting of knolls and depressions. Evidence of gilgai microrelief is destroyed after a few years of cultivation.

In the center of a microdepression, typically, the surface layer is mildly alkaline, black clay about 4 inches thick. From 4 to 47 inches is moderately alkaline, very dark gray clay. From 47 to 80 inches is calcareous, moderately alkaline clay that is gray in the upper part and grades to light brownish gray in the lower part.

This soil is somewhat poorly drained. Permeability is very slow, and available water capacity is high. When this soil is dry, deep wide cracks form to the surface. Water enters rapidly through the cracks, but it enters very slowly when the soil is wet and the cracks close. Runoff is slow, and the hazard of water erosion is moderate. This soil is saturated at times during winter.

Included in mapping are small areas of Dacosta and Contee soils, which make up less than 15 percent of any mapped area. Small eroded areas along drainageways are also included.

This Lake Charles soil is used mainly as rangeland and pastureland. It is in the Blackland range site.

This soil is well suited to crops, mainly grain sorghum, corn, and cotton. Good management includes growing cover crops, leaving crop residue on the surface when crops are not grown, and timely and limited tillage. Terraces, contour farming, and protected terrace outlets are needed.

This soil is well suited to improved pastures of bermudagrass and Gordo bluestem.

This soil is poorly suited to most urban and recreation uses. The main limitations are the shrink-swell potential, wetness, and clayey texture. Most of the limitations can be overcome by good design and careful installation.

This soil supports habitat for dove and quail. The Attwater prairie chicken is in a few well managed areas of rangeland. Mottled ducks nest in some areas, generally in lower parts near water.

This soil is in capability subclass IIe.

**LaD—Lake Charles clay, 5 to 8 percent slopes, eroded.** This deep, sloping soil is in long, narrow areas adjacent to drainageways. Erosion has removed some of the original surface layer in most areas. In all areas rills and shallow gullies that are 5 to 15 inches deep, 3 to 10 feet wide, and 50 to 200 feet apart have been cut. Many areas that had shallow gullies have been smoothed and planted to bermudagrass. Areas range from 30 to 200 acres.

In a microdepression, typically, the surface layer is mildly alkaline, black clay about 3 inches thick. From 3 to 24 inches is moderately alkaline, very dark gray clay.

Between depths of 24 and 80 inches is calcareous, moderately alkaline clay that is very dark grayish brown in the upper part. It grades to yellowish brown and has brownish and yellowish mottles in the lower part.

This soil is somewhat poorly drained. Permeability is very slow, and available water capacity is high. Water enters rapidly when the soil is dry and cracked and very slowly when it is moist. Runoff is rapid, and the hazard of water erosion is severe. This soil is saturated at times during winter.

Included in mapping are small areas of Dacosta, Contee, Faddin, and Runge soils. The included soils make up less than 20 percent of any mapped area.

This Lake Charles soil is used mainly as rangeland and pastureland. It is in the Blackland range site.

This soil is poorly suited to crops. The main crops are grain sorghum and corn. Careful management is needed to improve water intake and reduce runoff. Good management includes maintaining crop residue on the surface to help control water erosion and conserve moisture. Terraces, contour farming, and protected terrace outlets are needed.

This soil is well suited to improved pastures of bermudagrass and Gordo bluestem.

This soil is poorly suited to most urban and recreation uses. The main limitations are the shrink-swell potential, wetness, and clayey texture. Most of the limitations can be overcome by good design and careful installation.

This soil supports habitat for dove and quail. The Attwater prairie chicken is in a few well managed areas of rangeland. Mottled ducks nest in some areas, generally in lower parts of rangeland near water.

This soil is in capability subclass IVe.

**LcB—Lake Charles-Urban land complex, 0 to 3 percent slopes.** This nearly level to gently sloping complex is in urban areas on broad uplands. The areas are irregular in shape and range from 30 to 500 acres. The slope is mainly 0 to 1 percent but ranges up to 3 percent near drainageways.

Lake Charles soils make up 50 to 65 percent of the complex, commonly about 60 percent. Urban land makes up about 15 to 35 percent of the complex, commonly about 25 percent. The included soils make up about 15 percent. The areas of Lake Charles soils and areas of Urban land are so intricately mixed that mapping them separately is not practical at the scale used.

The Lake Charles soils make up vacant lots, yards, and other open areas. The surface of the Lake Charles soils is characterized by gilgai microrelief consisting of microknolls and microdepressions. In the center of microdepressions, the surface layer typically is about 46 inches thick. The upper 23 inches is neutral black clay, and the lower 23 inches is moderately alkaline, very dark gray clay. From 46 to 54 inches is moderately alkaline, dark gray clay. Below that, to a depth of 80 inches, the soil is moderately alkaline, mottled very pale brown clay.

These soils are somewhat poorly drained. Permeability and internal drainage are very slow, and available water capacity is high. When the soils are dry, deep, wide cracks form at the surface. Water enters rapidly through the cracks, but it enters very slowly when the soils are wet and the cracks are closed. Runoff is slow, and the hazard of water erosion is slight. The soils may be saturated at times during winter.

The areas of Urban land, originally areas of Lake Charles soils, are covered by buildings or other urban structures, including single and multiple-unit dwellings, streets, driveways, schools, churches, parking lots, office buildings, industrial sites, and shopping centers that are less than 20 acres.

Included in mapping are small areas of Dacosta soils. Also included are remnants of Lake Charles soils that have been altered by cutting, filling, and grading. The included soils make up less than 15 percent of any mapped area.

The Lake Charles soils are poorly suited to most urban uses. The shrink-swell potential and wetness are the main limitations to building and road development. The risk of corrosion to uncoated steel is high. The soils are poorly suited to most recreation uses because of their clayey texture, very slow permeability, and wetness during winter and spring. The suitability of these soils for establishing landscape plantings and gardens is poor because of the high clay content and wetness. Most limitations to urban uses, however, can be overcome by good design and careful installation.

The soils in this complex are not assigned to a capability subclass or a range site.

**LmB—Leming loamy fine sand, 1 to 3 percent slopes.** This deep, gently sloping soil is on low ridges near drainageways. Areas are long and narrow and range from 20 to 100 acres.

Typically, the surface layer is neutral, dark brown loamy fine sand about 29 inches thick. The subsoil from 29 to 60 inches is slightly acid, mottled, light brownish gray sandy clay. The underlying material to a depth of 80 inches is neutral, red sandy clay.

This soil is moderately well drained to somewhat poorly drained. Permeability is slow, and available water capacity is medium. Tilth is good, and the soil can be worked throughout a wide range of moisture conditions. Runoff is slow to medium, and the hazard of water erosion is slight to moderate.

Included in mapping are small areas of Papalote, Straber, and Weesatche soils. The included soils make up less than 10 percent of any mapped area.

This Leming soil is used as pastureland and rangeland. It is in the Sandy range site.

This soil is moderately well suited to improved pastures of lovegrass and Pensacola bahiagrass.

This soil is moderately well suited to most urban and recreation uses. The main limitation is moderate shrink-

swell potential in the subsoil. Most limitations can be overcome by good design and careful installation.

This soil supports habitat for turkey, deer, dove, quail, and squirrel. The habitat produces enough browse, mast, seeds, and tender grazing to supply food the year round and produces ample cover.

This soil is in capability subclass IIIe.

**Me—Meguin silty clay, occasionally flooded.** This deep, nearly level soil is on wide flood plains of major rivers. Areas are irregular to oblong and range from 20 to 1,000 acres. The slope ranges from 0 to 1 percent.

Typically, the surface layer is calcareous, moderately alkaline, very dark grayish brown silty clay about 13 inches thick. The subsoil to 80 inches is calcareous, moderately alkaline silty clay loam. It is grayish brown in the upper part, very dark grayish brown in the middle part, and brown in the lower part.

This soil is well drained. Permeability is moderate, and available water capacity is high. Runoff is slow. The hazard of water erosion is slight except in areas subject to streambank caving. The soil is inundated about once every 2 to 8 years for a few hours to 2 days. A few small areas are briefly flooded by runoff from adjacent uplands. The soil dries slowly in spring, and cultivation is usually delayed. This soil is difficult to work because of the clayey texture and is easily compacted if worked when too wet.

Included in mapping are small areas of Trinity and Rydolph soils. The included soils make up less than 15 percent of any mapped area.

This Meguin soil is used as rangeland, pastureland, and cropland. It is in the Loamy Bottomland range site.

This Meguin soil is well suited to crops. Grain sorghum and corn are the main crops. Good management includes leaving residue on the surface when crops are not grown, timely and limited tillage, crop rotation, and incorporating crop residue into the soil to help maintain favorable soil structure and tilth.

This soil is well suited to improved pastures of bermudagrass and kleingrass.

This soil is not suited to urban use because of the flood hazard. It is moderately well suited to recreation uses. The clayey surface layer is the main limitation to recreation uses.

This soil supports habitat for deer, duck, squirrel, swamp rabbit, and other furbearing animals. Nesting areas for quail, dove, and songbirds are plentiful.

This soil is in capability subclass IIw.

**Mf—Meguin silty clay, frequently flooded.** This deep, nearly level soil is on wide, extensive flood plains of major rivers. Areas are irregular and oblong and range from 50 to 1,000 acres. The surface of most areas is marked by partly filled old stream and scour channels. The slope ranges from 0 to 1 percent.



Typically, the surface layer is calcareous, moderately alkaline, very dark grayish brown silty clay about 10 inches thick. The upper part of the subsoil, from 10 to 26 inches, is calcareous, moderately alkaline, dark grayish brown silty clay loam. The lower part to a depth of 60 inches is calcareous, moderately alkaline, grayish brown silty clay loam.

This soil is well drained. Permeability is moderate, and available water capacity is high. Runoff is slow. The hazard of water erosion is slight except in areas subject to streambank caving. The soil is flooded 1 to 5 times annually for 2 to 10 days.

Included in mapping are small areas of Trinity and Rydolph soils. The included soils make up less than 20 percent of any mapped area.

This Meguin soil is used as rangeland and pastureland. It is in the Loamy Bottomland range site.

This soil is poorly suited to crops because of the flood hazard. It is well suited to improved pastures of bermudagrass and kleingrass.

This soil is not suited to most urban uses because of the flood hazard. It is poorly suited to recreation uses because of the clayey surface layer and the flood hazard.

This soil supports habitat for deer, duck, squirrel, swamp rabbit, and other furbearing animals. Nesting areas for quail, dove, and songbirds are plentiful.

This soil is in capability subclass Vw.

#### **NcA—Nada-Cieno complex, 0 to 1 percent slopes.**

This complex of nearly level soils is on broad uplands. Areas are as large as 3,000 acres.

The Nada soils make up 60 to 75 percent of the complex, commonly about 70 percent. The Cieno soils make up 15 to 30 percent of the complex, commonly about 20 percent. Other soils make up about 10 percent of this complex. Areas of these soils are so intricately mixed that mapping them separately is not practical at the scale used.

The Cieno soils are in oval, concave depressions, or "potholes," which are 6 to 18 inches below the adjacent soils and are less than an acre to about 20 acres. The Nada soils are in slightly higher, convex low areas.

Typically, the Nada soils have a surface layer of neutral, dark grayish brown sandy loam about 8 inches thick. The subsoil from 8 to 25 inches is neutral, mottled dark gray sandy clay loam. From 25 to 35 inches the subsoil is mildly alkaline, mottled grayish brown sandy clay loam; and from 35 to 80 inches it is moderately alkaline, mottled light brownish gray sandy clay loam.

The Nada soils are poorly drained. Permeability is very slow, and available water capacity is high. Runoff is slow, and the hazard of water erosion is slight. A perched water table is at a depth of 0.5 to 1 foot during rainy seasons. The soils are seasonally wet and droughty.

Typically, the Cieno soils have a surface layer of medium acid, dark gray sandy clay loam about 6 inches thick. The subsoil from 6 to 28 inches is dark gray clay loam that is medium acid in the upper part and slightly acid in the lower part. From 28 to 80 inches the subsoil is mottled brown, yellow, and gray sandy clay loam that is neutral to a depth of 40 inches and mildly to moderately alkaline below. Uncoated sand covers the surface of some peds below a depth of 28 inches.

The Cieno soils are poorly drained. Permeability is very slow, and available water capacity is high. The soils receive water from surrounding soils and are ponded for several days to more than a month during rainy seasons. The hazard of water erosion is slight. The soils are seasonally wet and droughty.

Included in mapping are small areas of Telferner and Fordtran soils, and also included are a few scattered mounds 40 to 100 feet wide and 12 to 24 inches high. The soils making up the mounds are similar to the Nada soils except that the surface layer is 18 to 30 inches thick. Included soils make up less than 15 percent of any mapped area.

These Nada and Cieno soils are used as cropland, rangeland, and pastureland. The Nada soils are in the Claypan Prairie range site, and the Cieno soils are in the Lowland range site.

These soils are well suited to crops, mainly rice (fig. 7). Surface crusts and plowpans are common in cultivated fields. In large, nearly level areas, runoff is very slow, and excess water collects on the surface during rainy seasons. Good management includes leaving residue on the surface when crops are not grown, timely and limited tillage, and crop rotation. Incorporating crop residue into the soil also helps maintain favorable soil structure and tilth and water intake. Drainage systems, such as main and lateral ditches, field ditches, or ricefield outlets, can be planned so that the use of farm equipment is not inhibited. Because adequate outlets for water are difficult to locate, they need to be considered first in planning drainage systems. Land leveling before rice irrigation is needed. Fertilizer is needed for maximum crop production.

These soils are moderately well suited to improved pastures of bermudagrass and Gordo bluestem.

These soils are poorly suited to most urban and recreation uses. The main limitations—wetness, ponding, and very slow permeability—generally can be overcome by good design and careful installation.

These soils support habitat for dove and quail in summer and fall when they are not too wet. Mottled ducks nest in some areas, generally in lower parts of rangeland near water. Migratory ducks occupy the habitat when it is ponded and food plants are available. The Attwater prairie chicken is in a few well managed areas of rangeland.





*Figure 7.—Harvesting rice on Nada-Cieno complex, 0 to 1 percent slopes.*

The soils in this complex are in capability subclass IIIw.

**PaB—Papalote fine sandy loam, 1 to 3 percent slopes.** This deep, gently sloping soil is on broad uplands. Areas are irregular in shape and range from 40 to 300 acres.

Typically, the surface layer is neutral, dark gray fine sandy loam about 16 inches thick. The subsoil from 16 to 25 inches is neutral, mottled, very dark grayish brown clay. From 25 to 38 inches the subsoil is neutral, mottled, grayish brown clay; and from 38 to 45 inches it is moderately alkaline, mottled, brown clay. Below that, to a depth of 80 inches, is moderately alkaline, pink sandy clay loam.

This soil is moderately well drained. Permeability is slow, and available water capacity is medium. Tilth is good, and the soil can be worked throughout a wide

range of moisture conditions. Surface runoff is slow to medium, and the hazard of water erosion is moderate.

Included in mapping are small areas of Weesatche and Sarnosa soils. The included soils make up less than 20 percent of any mapped area.

This Papalote soil is used as rangeland, pastureland, and cropland. It is in the Tight Sandy Loam range site.

This soil is moderately well suited to crops. Corn and grain sorghum are the main crops. Good management includes leaving residue on the surface when crops are not grown, timely and limited tillage, and crop rotation. Growing cover crops and soil-improving crops and incorporating crop residue into the soil help control erosion and maintain productivity and tilth. Contour farming and terraces are needed to control erosion if row crops are grown. Fertilizer is needed for maximum crop production.



This soil is moderately well suited to improved pastures of bermudagrass and kleingrass.

This soil is moderately well suited to most urban uses. The main limitation is the moderate shrink-swell potential of the soil. This limitation can be overcome by good design and careful installation. The soil is well suited to recreation uses.

This soil supports habitat for deer, dove, quail, small furbearing animals, and coyote.

This soil is in capability subclass IIe.

**Pb—Pits.** This map unit occurs on uplands. Areas are square or oblong and range from 15 to 30 acres.

Pits were excavated during the mining of sand, gravel, and caliche. They have nearly vertical walls and are 3 to 25 feet deep. In some places they are used as areas for sanitary landfill. Pits commonly are ponded for extended periods.

Most areas are idle land. Some are still mined.

Pits are not assigned to a capability subclass or to a range site.

**Pd—Pits and Dumps.** This map unit of deep excavations and mounds of mixed soil material is in areas where sand and gravel have been mined. It is on flood plains of major rivers. The mound slopes range from 3 to 30 percent. Areas are nearly square or oblong and are 20 to 550 acres.

The areas are 50 to 68 percent pits, 16 to 40 percent dumps, and 10 to 25 percent included soils. A typical area consists of about 55 percent pits, 30 percent dumps, and 15 percent included soils. The components do not occur in a regular pattern.

Pits were excavated during the mining of sand and gravel. They have gently sloping to vertical walls, are 10 to 40 feet deep, and commonly are partly or completely filled with water in most years. Pits range from 10 to 300 acres in size.

Dumps are gently sloping to steep mounds of soil materials 5 to 20 feet high. The soil materials are either clayey or loamy overburden or byproducts of the mining operations. The original soil layers have been mixed to depths of more than 80 inches. Strata of sand, gravelly loam, and clay and fragments of wood, metal, glass, and plastic are throughout. The dumps range from 10 to 50 acres in size.

Included in mapping, and making up less than 25 percent of any mapped area, are small areas of Trinity and Meguin soils.

Most areas are idle, and some are still mined.

Pits and Dumps are not assigned to a capability subclass or to a range site.

**Pe—Placedo silty clay loam, frequently flooded.** This deep, nearly level soil is in narrow areas along flood plains of rivers at or near sea level. In most areas the surface is marked by partly filled old stream and scour

channels. Areas are irregular in shape and range from 100 to 500 acres. The slope ranges from 0 to 1 percent.

Typically, the surface layer is extremely saline, moderately alkaline, dark gray silty clay loam about 12 inches thick. From 12 to 36 inches is extremely saline, moderately alkaline, dark gray clay. From 36 to 60 inches is extremely saline, moderately alkaline, dark gray silty clay.

This soil is very poorly drained. Permeability is very slow, and available water capacity is very low. Runoff is very slow or ponded, and the hazard of water erosion is slight except in areas subject to streambank caving. The soil is frequently flooded by high tides from coastal bay areas and is flooded 2 to 4 times annually by overflow for periods of 5 to 21 days. In most years, the soil is saturated for long periods and seldom dries below 12 inches. The seasonal high water table is at a depth of less than 12 inches.

Included in mapping are small areas of Austwell and Aransas soils. The included soils make up less than 5 percent of any mapped area.

This Placedo soil is used as rangeland and wildlife habitat. It is in the Salt Marsh range site. It is not suited to crops because of high salinity and flooding.

This soil is not suited to urban and recreation uses because of the flood hazard.

This soil supports habitat for a large variety and number of game birds, animals, and marine life. It supports the habitat preferred by the alligator. Nesting areas for mottled ducks, tree ducks, and wood ducks are plentiful. Migratory ducks, geese, rails, coots, and cranes are common in fall and winter.

This soil is in capability subclass VIIw.

**RaB—Runge fine sandy loam, 0 to 2 percent slopes.** This deep, nearly level to gently sloping soil is on uplands. Areas are irregular in shape and range from 20 to 100 acres.

Typically, the surface layer is neutral, dark brown fine sandy loam about 9 inches thick. The subsoil from 9 to 13 inches is neutral, dark brown sandy clay loam. From 13 to 28 inches the subsoil is neutral, yellowish red sandy clay loam. The lower part of the subsoil, to 43 inches, is neutral, strong brown sandy clay loam. Below that, to a depth of 60 inches, is calcareous, moderately alkaline, light yellowish brown sandy clay loam.

This soil is well drained. Permeability is moderate, and available water capacity is high. This soil has good tilth and can be worked throughout a wide range of moisture conditions. Runoff is medium, and the hazard of water erosion is slight.

Included in mapping are small areas of Edna, Weesatche, and Telferner soils. The included soils make up less than 15 percent of any mapped area.

This Runge soil is used as pastureland, cropland, and rangeland. It is in the Sandy Loam range site.

This soil is moderately well suited to crops, mainly corn and grain sorghum. Good management includes leaving residue on the surface when crops are not grown, timely and limited tillage, and crop rotation. Terraces are needed if row crops are grown. Fertilizer is needed for maximum crop production.

This soil is moderately well suited to improved pastures of lovegrass and Pensacola bahiagrass.

This soil is moderately well suited to most urban uses. It is limited mainly by its shrink-swell potential. This limitation can be overcome by good design and careful installation. The soil is well suited to recreation uses.

This soil supports habitat for dove and quail. The habitat has ample cover and enough browse, mast, seeds, and tender grazing to supply food the year round.

This soil is in capability subclass IIe.

**RaC—Runge fine sandy loam, 2 to 5 percent slopes.** This deep, gently sloping soil is on breaks and hillsides above large streams. Areas are irregular to elongated. They range from 30 to 100 acres.

Typically, the surface layer is neutral, very dark grayish brown fine sandy loam about 12 inches thick. The subsoil, from 12 to 47 inches, is neutral sandy clay loam that is dark reddish brown in the upper part, yellowish red in the middle part, and strong brown in the lower part. Below that, to a depth of 60 inches, is calcareous, moderately alkaline, reddish yellow sandy clay loam.

This soil is well drained. Permeability is moderate, and available water capacity is high. Tilth is good, and the soil can be worked throughout a wide range of moisture conditions. Runoff is medium, and the hazard of water erosion is moderate.

Included in mapping are small areas of Edna, Faddin, and Telferner soils. The included soils make up less than 20 percent of any mapped area.

This Runge soil is used as pastureland and rangeland. It is in the Sandy Loam range site.

This soil is moderately well suited to crops. Grain sorghum and corn are the main crops. Good management includes leaving residue on the surface when crops are not grown, timely and limited tillage, and crop rotation. Contour farming and terraces are needed on this soil. Terraces and stable outlets are needed if row crops are grown. Fertilizer is needed for maximum crop production.

This soil is moderately well suited to improved pastures of lovegrass and Pensacola bahiagrass.

This soil is moderately well suited to most urban uses. The main limitation is the moderate shrink-swell potential of the soil. This limitation can be overcome by good design and careful installation. The soil is well suited to most recreation uses.

This soil supports habitat for dove and quail. The habitat has ample cover and enough browse, mast, seeds, and tender grazing to supply food the year round.

This soil is in capability subclass IIIe.

**RbC—Rupley fine sand, 1 to 5 percent slopes.** This deep, gently sloping soil is on rounded or oblong, hummocky upland areas near major tributaries of large rivers. Areas range from 10 to 200 acres.

Typically, the surface layer is about 20 inches thick. It is neutral, brown fine sand in the upper part and slightly acid, pale brown fine sand in the lower part. Between depths of 20 and 62 inches is slightly acid, yellowish brown fine sand, and below that, to a depth of 80 inches, is medium acid, mottled, light brownish gray fine sand.

This soil is somewhat excessively drained. Permeability is rapid, and available water capacity is low. Runoff is very slow, and the hazard of water erosion is slight. An apparent water table is at a depth of 5 to 6 feet during rainy seasons.

Included in mapping are small areas of Kuy, Fordtran, and Telferner soils. The included soils make up less than 10 percent of any mapped area.

This Rupley soil is used as rangeland. It is in the Deep Sand range site.

This soil is well suited to most urban uses and is poorly suited to recreation uses. The main limitation to recreation uses is the sandy surface layer. This limitation can be overcome by good design and careful installation.

This soil supports habitat for deer, dove, quail, and squirrel. The habitat has ample cover and enough browse, mast, forbs, and seeds to supply food the year round.

This soil is in capability subclass VIc.

**Rd—Rydolph silty clay, occasionally flooded.** This deep, nearly level soil is on wide flood plains of rivers. Areas are oblong and range from 50 to 2,000 acres. They are protected from frequent flooding by levees and deep drainage channels. The slope ranges from 0 to 1 percent.

Typically, the surface layer is calcareous, strongly alkaline, dark grayish brown silty clay about 9 inches thick. From 9 to 32 inches is calcareous, slightly saline, very strongly alkaline, mottled, grayish brown loam; from 32 to 48 inches is calcareous, moderately saline, strongly alkaline, grayish brown silty clay loam; from 48 to 59 inches is calcareous, moderately saline, strongly alkaline, mottled, brown silt loam; and from 59 to 71 inches is calcareous, moderately saline, strongly alkaline, mottled, grayish brown silty clay loam. Below that, to a depth of 80 inches, is calcareous, moderately saline, strongly alkaline, gray loam.

This soil is somewhat poorly drained. Permeability is slow, and available water capacity is high. Runoff is slow, and the hazard of water erosion is slight except in areas subject to streambank caving. About once in 2 to 8 years, the soil is flooded from a few hours to 4 or 5 days. It dries slowly in spring, and cultivation is usually delayed. The clayey texture makes it difficult to work. The soil is easily compacted if worked when too wet.



Included in mapping are small areas of Austwell, Meguin, and Trinity soils. The included soils make up less than 20 percent of any mapped area.

This Rydolph soil is used as rangeland (fig. 8), pastureland, and cropland. It is in the Loamy Bottomland range site.

This soil is well suited to crops. Grain sorghum and corn are the main crops. Good management includes incorporating crop residue into the soil to conserve moisture and maintain tilth and productivity. In large areas, runoff is slow and excess water collects on the surface during rainy seasons. In some areas, rows can be laid out in such a way as to remove excess surface water. Drainage ditches are beneficial if adequate outlets are available.

This soil is well suited to improved pastures of Gordo bluestem and kleingrass.

This soil is not suited to most urban and recreation uses because of the flood hazard.

This soil supports habitat for deer, duck, squirrel, swamp rabbit, and other furbearing animals. Nesting areas for quail, dove, and songbirds are plentiful.

This soil is in capability subclass IIw.

**Rf—Rydolph silty clay, frequently flooded.** This deep, nearly level soil is on flood plains of rivers. Areas are oblong and narrow and range from 100 to 500 acres. In most areas the surface is marked by partly filled old stream and scour channels. The slope ranges from 0 to 1 percent.



*Figure 8.—The vegetation in this area of Rydolph silty clay, occasionally flooded, is characteristic of the Loamy Bottomland range site.*

Typically, the surface layer is calcareous, moderately alkaline dark gray silty clay about 8 inches thick. Between depths of 8 and 20 inches is calcareous, slightly saline, strongly alkaline, mottled grayish brown silty clay loam. Below that, to a depth of 60 inches, is calcareous, moderately saline, strongly alkaline, mottled, grayish brown silty clay loam.

This soil is somewhat poorly drained. Permeability is slow, and available water capacity is high. Runoff is slow, and the hazard of water erosion is slight except in areas subject to streambank caving. The soil is inundated 1 to 3 times annually for 2 to 10 days.

Included in mapping are small areas of Austwell, Meguin, and Trinity soils. The included soils make up less than 25 percent of any mapped area.

This Rydolph soil is used mainly as rangeland. It is in the Loamy Bottomland range site.

This soil is poorly suited to crops because of the hazard of flooding. It is well suited to improved pastures of Gordo bluestem and kleingrass.

This soil is not suited to most urban and recreation uses because of the hazard of flooding.

This soil supports habitat for deer, duck, squirrel, swamp rabbit, and other furbearing animals. Nesting areas for quail, dove, and songbirds are plentiful.

This soil is in capability subclass Vw.

**SaB—Sarnosa loam, 1 to 3 percent slopes.** This deep, gently sloping soil is on uplands. Areas are long and narrow and range from 20 to 70 acres.

Typically, the surface layer is calcareous, moderately alkaline, very dark grayish brown loam about 13 inches thick. The subsoil, from 13 to 43 inches, is calcareous, moderately alkaline, brown loam. To a depth of 70 inches is calcareous, moderately alkaline, light brown loam.

This soil is well drained. Permeability is moderate, and available water capacity is medium. This soil has good tilth and can be worked over a wide range of moisture conditions. Runoff is slow, and the hazard of water erosion is slight.

Included in mapping are small areas of Papalote and Weesatche soils. The included soils make up less than 20 percent of any mapped area.

This Sarnosa soil is used as pastureland, cropland, and rangeland. It is in the Gray Sandy Loam range site.

This soil is moderately well suited to crops. Grain sorghum and corn are the main crops. Good management includes leaving residue on the surface when crops are not grown, timely and limited tillage, and crop rotation. Growing cover crops and soil-improving crops and incorporating crop residue into the soil help control erosion and maintain productivity and tilth. Contour farming and terraces are needed to control erosion if row crops are grown. Fertilizer is needed for maximum crop production.

This soil is moderately well suited to improved pastures of bermudagrass and kleingrass.

This soil is well suited to most urban and recreation uses.

This soil supports habitat for deer, dove, quail, and songbirds. The habitat has ample cover and adequate browse, mast, seeds, and tender grazing for a year-round food supply.

This soil is in capability subclass Ile.

**SkC—Silvern very gravelly loamy sand, 1 to 5 percent slopes.** This deep, gently sloping soil is on low ridges. Areas range up to 200 acres.

Typically, the surface layer is medium acid, brown very gravelly loamy sand about 12 inches thick. From 12 to 46 inches is medium acid, pink very gravelly loamy sand. Below that, to a depth of 70 inches, is very strongly acid, mottled, dark red very gravelly sandy clay loam.

This soil is well drained. Permeability is rapid, and available water capacity is very low. Runoff is very slow, and the hazard of water erosion is slight.

Included in mapping are small areas of Tremona and Goldmire soils. Also included are soils that are similar to the Silvern soil except that the B2t horizon is at a depth of 20 to 40 inches. The included soils make up less than 20 percent of any mapped area.

This Silvern soil is used as rangeland. It is in the Gravelly range site.

This soil is moderately well suited to urban uses and is poorly suited to recreation uses. The main limitation is the high gravel content of the soil.

This soil supports habitat for deer, dove, quail, and squirrel. The habitat has ample cover and adequate browse, mast, forbs, and seeds for a year-round food supply.

This soil is in capability subclass VIs.

**Sn—Sinton loam, occasionally flooded.** This deep, nearly level soil is on narrow flood plains of major streams. Areas are narrow and oblong and are 30 to 1,000 acres. The slope ranges from 0 to 1 percent.

Typically, the surface layer is calcareous, moderately alkaline loam about 24 inches thick. It is black in the upper part and very dark gray in the lower part. Between depths of 24 and 50 inches is calcareous, moderately alkaline, dark grayish brown loam, and from 50 to 67 inches is calcareous, moderately alkaline, dark brown loam. Below that, to a depth of 80 inches, is calcareous, moderately alkaline, dark grayish brown sandy clay loam.

This soil is well drained. Permeability is moderate, and available water capacity is medium. Runoff is slow, and the hazard of water erosion is slight except in areas subject to streambank caving. The soil is flooded about once every 3 to 10 years for a few hours to 3 or 4 days. A few small areas are briefly flooded by runoff from adjacent uplands. Tilth is good and the soil can be



worked over a wide range of moisture conditions. If worked when too wet, it is easily compacted.

Included in mapping are small areas of Meguin and Trinity soils. The included soils make up less than 10 percent of any mapped area.

This Sinton soil is used as cropland, pastureland, and rangeland. It is in the Loamy Bottomland range site.

This soil is well suited to crops. Grain sorghum and corn are the main crops. Good management includes leaving residue on the surface when crops are not grown, timely and limited tillage, and crop rotation. Fertilizer is needed for maximum crop production.

This soil is moderately well suited to improved pastures of Gordo bluestem and kleingrass.

This soil is not suited to most urban uses because of the hazard of flooding. It is well suited to most recreation uses.

This soil supports habitat for deer, duck, squirrel, swamp rabbit, and other furbearing animals. Nesting areas for quail, dove, and songbirds are plentiful.

This soil is in capability subclass IIw.

**StB—Straber loamy fine sand, 0 to 2 percent slopes.** This deep, nearly level to gently sloping soil is on broad uplands. Areas are irregular in shape and are 40 to 300 acres.

Typically, the surface layer is slightly acid, pale brown loamy fine sand about 9 inches thick. From 9 to 13 inches is slightly acid, very pale brown loamy fine sand. The subsoil, from 13 to 46 inches, is very strongly acid to strongly acid, mottled, strong brown and light gray clay. Below that, to a depth of 65 inches, is slightly acid, light gray sandy clay.

This soil is moderately well drained. Permeability is slow, and available water capacity is medium. This soil has good tilth and can be worked over a wide range of moisture conditions. Runoff is slow or medium, and the hazard of water erosion is slight.

Included in mapping are small areas of Papalote, Leming, and Tremona soils. The included soils make up less than 20 percent of any mapped area.

This Straber soil is used as rangeland and pastureland. It is in the Sandy Loam range site.

This soil is moderately well suited to improved pastures of lovegrass and Pensacola bahiagrass.

This soil is moderately well suited to most urban and recreation uses. It is limited mainly by the moderate shrink-swell potential and slow permeability. Most of the limitations can be overcome by good design and careful installation.

This soil supports habitat for deer, dove, turkey, quail, and squirrel. The habitat has ample cover and enough browse, mast, seeds, and tender grazing for a year-round food supply.

This soil is in capability subclass IIIe.

**StC—Straber loamy fine sand, 2 to 5 percent slopes.** This deep, gently sloping soil is on broad ridges. Areas are irregular in shape and are 20 to 300 acres.

Typically, the surface layer is slightly acid, dark grayish brown loamy fine sand about 12 inches thick. The subsoil from 12 to 20 inches is strongly acid, mottled, brown clay. From 20 to 25 inches the subsoil is strongly acid, mottled, brownish yellow clay; and from 25 to 53 inches it is medium acid, mottled, gray sandy clay loam. The next layer, from 53 to 72 inches, is moderately alkaline, light yellowish brown clay loam. Below that, to a depth of 80 inches, the soil is calcareous, moderately alkaline, mottled, light yellowish brown clay loam.

This soil is moderately well drained. Permeability is slow, and available water capacity is medium. Runoff is medium, and the hazard of water erosion is moderate.

Included in mapping are small areas of Papalote, Leming, and Tremona soils. The included soils make up less than 20 percent of any mapped area.

This Straber soil is used as rangeland and pastureland. It is in the Sandy Loam range site.

This soil is moderately well suited to improved pastures of lovegrass and Pensacola bahiagrass.

This soil is moderately well suited to urban and recreation uses. The main limitations are the moderate shrink-swell potential and slow permeability. Most of these limitations can be overcome by good design and careful installation.

This soil supports habitat for deer, dove, turkey, quail, and squirrel. The habitat has ample cover and enough browse, mast, seeds, and tender grazing for a year-round food supply.

This soil is in capability subclass IIIe.

**TeA—Telferner fine sandy loam, 0 to 1 percent slopes.** This deep, nearly level soil is on broad uplands and long narrow areas along small streams. Areas range from 40 to 900 acres.

Typically, the surface layer is slightly acid, dark grayish brown fine sandy loam about 10 inches thick. From 10 to 16 inches is slightly acid, mottled, light brownish gray fine sandy loam. The subsoil from 16 to 24 inches is slightly acid, mottled, grayish brown sandy clay; from 24 to 40 inches is slightly acid, mottled, light brownish gray clay loam; and from 40 to 50 inches is mildly alkaline, mottled, light gray clay loam. The lower part of the subsoil to a depth of 80 inches is calcareous, moderately alkaline, mottled, light gray sandy clay loam.

This soil is somewhat poorly drained. Permeability is very slow, and available water capacity is medium. The soil has good tilth and can be worked over a wide range of moisture conditions. Runoff is slow, and the hazard of water erosion is slight. A perched water table is at a depth of 0.5 foot to 2.0 feet during rainy seasons. The soil is seasonally wet and droughty.

Included in mapping are small areas of Edna, Dacosta, and Fordtran soils. Also included are areas of Nada and

Cieno soils that are 10 to 20 acres. The included soils make up less than 25 percent of any mapped area.

This Telferner soil is used as cropland, pastureland, and rangeland. It is in the Loamy Prairie range site.

This soil is moderately well suited to crops. Grain sorghum and corn are the main crops. Rice is grown in a few areas. Good management includes leaving residue on the surface when crops are not grown, timely and limited tillage, and crop rotation. Growing cover crops and soil-improving crops and incorporating crop residue into the soil help control erosion and maintain productivity and tilth. Fertilizer is needed for maximum crop production. Drainage ditches are beneficial when adequate outlets are available.

This soil is well suited to improved pastures of kleingrass and Pensacola bahiagrass.

This soil is poorly suited to most urban and recreation uses. The main limitations are the shrink-swell potential, wetness, and very slow permeability. Most of the limitations can be overcome by good design and careful installation.

This soil supports habitat for dove and quail. The Attwater prairie chicken is in a few well managed areas of rangeland. Mottled ducks nest in some areas of rangeland, generally in lower parts near water.

This soil is in capability subclass IIIw.

**TeB—Telferner fine sandy loam, 1 to 3 percent slopes.** This deep, gently sloping soil is on low ridges and side slopes along drainageways. Areas are narrow and somewhat oval and range from 35 to 80 acres.

Typically, the surface layer is medium acid, grayish brown fine sandy loam about 7 inches thick. From 7 to 12 inches is medium acid, light brownish gray fine sandy loam. The subsoil from 12 to 40 inches is slightly acid, mottled, dark grayish brown sandy clay; and to a depth of 60 inches it is moderately alkaline, mottled, light yellowish brown sandy clay loam.

This soil is somewhat poorly drained. Permeability is very slow, and available water capacity is medium. This soil has good tilth and can be worked over a wide range of moisture conditions. Runoff is slow, and the hazard of water erosion is moderate. A perched water table is at a depth of 0.5 foot to 2.0 feet during rainy seasons. This soil is seasonally wet and droughty.

Included in mapping are small areas of Edna, Dacosta, and Fordtran soils. The included soils make up less than 20 percent of any mapped area.

This soil is used as cropland, pastureland, and rangeland. It is in the Loamy Prairie range site.

This soil is moderately well suited to crops. Grain sorghum and corn are the main crops. Good management includes leaving residue on the surface when crops are not grown, timely and limited tillage, and crop rotation. Contour farming and terraces are needed on this soil. Terraces and stable outlets are needed if

row crops are grown. Fertilizer is needed for maximum crop production.

This soil is well suited to improved pastures of kleingrass and Pensacola bahiagrass.

This soil is poorly suited to most urban and recreation uses. The main limitations are the shrink-swell potential, wetness, and very slow permeability. Most of the limitations can be overcome by good design and careful installation.

This soil supports habitat for dove and quail. The Attwater prairie chicken is in a few well managed areas of rangeland. Mottled ducks nest in some areas of rangeland, generally in lower parts near water.

This soil is in capability subclass IIIe.

**TfB—Telferner-Urban land complex, 0 to 3 percent slopes.** This nearly level to gently sloping complex is in urban areas on broad uplands. The areas are irregular in shape and range from 20 to 300 acres. The slope is mainly 0 to 1 percent but ranges up to 3 percent near drainageways.

Telferner soils make up 50 to 65 percent of the complex, commonly about 60 percent. Urban land makes up 15 to 35 percent of the complex, commonly about 25 percent. The included soils make up about 15 percent of the complex. The areas of Telferner soils and areas of Urban land are so intricately mixed that mapping them separately is not practical at the scale used.

The Telferner soils make up vacant lots, yards, and other open areas. Typically, the surface layer of the Telferner soil is slightly acid, dark grayish brown fine sandy loam about 10 inches thick. From 10 to 16 inches is slightly acid, mottled, light brownish gray fine sandy loam. The subsoil from 16 to 24 inches is slightly acid, mottled, grayish brown sandy clay; from 24 to 40 inches it is slightly acid, mottled, light brownish gray clay loam; and from 40 to 50 inches it is mildly alkaline, mottled, light gray clay loam. The lower part of the subsoil to 80 inches is calcareous, moderately alkaline, mottled, light gray sandy clay loam.

This soil is somewhat poorly drained. Permeability is very slow and available water capacity is medium. Runoff is slow, and the hazard of water erosion is slight.

The areas of Urban land, originally areas of Telferner soils, are covered by buildings or other urban structures, including single- and multiple-unit dwellings, streets, driveways, schools, churches, parking lots, office buildings, industrial sites, and shopping centers that are less than 20 acres.

Included in mapping are small areas of Edna, Fordtran, and Dacosta soils. Also included are remnants of Telferner soil where cutting, filling, and grading have altered the upper soil layers. The included soils make up less than 15 percent of any mapped area.

The Telferner soils are poorly suited to most urban uses. The shrink-swell potential and wetness are the main limitations to building and road development. The



risk of corrosion to uncoated steel is high. The soils are poorly suited to most recreation uses because of wetness during winter and spring. The suitability of these soils for landscape plantings and gardens is poor because of wetness. Most limitations can be overcome by good design and careful installation.

The soils in this complex are not assigned a range site or to a capability subclass.

**TgC—Tremona gravelly loamy sand, 1 to 3 percent slopes.** This deep, gently sloping soil is on the crests and sides of low ridges. Areas are oblong and range from 20 to 80 acres.

Typically, the surface layer is slightly acid, dark brown gravelly loamy sand about 10 inches thick. From 10 to 35 inches is slightly acid, very pale brown very gravelly loamy sand. The subsoil between depths of 35 and 56 inches is very strongly acid, mottled, light brownish gray sandy clay. The lower part of the subsoil to a depth of 80 inches is strongly acid, mottled, pale brown sandy clay loam.

This soil is somewhat poorly drained. Permeability is very slow, and available water capacity is low. Runoff is slow, and the hazard of water erosion is slight. A perched water table is at a depth of 1.5 to 3.5 feet during rainy seasons.

Included in mapping are small areas of Straber, Papalote, and Silvern soils. The included soils make up less than 10 percent of any mapped area.

This Tremona soil is used as rangeland. It is in the Gravelly range site.

This soil is moderately well suited to urban uses and is poorly suited to recreation uses. The main limitations are wetness, shrink-swell potential, and the content of sand and gravel. Most limitations can be overcome by good design and careful installation.

This soil supports habitat for deer, dove, quail, and squirrel. The habitat has ample cover and enough browse, mast, forbs, and seeds for a year-round food supply.

This soil is in capability subclass IVs.

**To—Trinity clay, occasionally flooded.** This deep, nearly level soil is on wide flood plains of major rivers. Areas are oblong and range from 40 to 300 acres. They are protected from frequent flooding by levees and deep drainage channels. The slope ranges from 0 to 1 percent.

Typically, the surface layer is calcareous, moderately alkaline clay about 20 inches thick. It is very dark gray in the upper part and black in the lower part. From 20 to 80 inches is calcareous, moderately alkaline, very dark gray clay mottled with brown.

This soil is somewhat poorly drained. Permeability is very slow, and available water capacity is high. The soil cracks when it is dry. Water enters rapidly until the cracks swell shut; then water enters very slowly. Runoff

is very slow, and the hazard of water erosion is slight except in areas subject to streambank caving. The soil is inundated about once every 3 to 8 years from a few hours to 3 or 4 days. A few small areas are briefly flooded by runoff from adjacent uplands. The soil dries slowly in spring, and cultivation is annually delayed. Because of the clayey texture, this soil is difficult to work, and it is easily compacted if worked when too wet.

Included in mapping are small areas of Sinton, Rydolph, and Meguin soils. The included soils make up less than 10 percent of any mapped area.

This soil is used mainly as pastureland and rangeland. In a few areas it is used as cropland. It is in the Clayey Bottomland range site.

This soil is well suited to crops. Grain sorghum and corn are the chief crops. Favorable soil structure and tilth are difficult to maintain, and the moisture range in which the soil can be cultivated is narrow. Surface crusts and plowpans are common in cultivated fields. In large, nearly level areas, runoff is very slow, and excess water collects on the surface during rainy periods. Good management includes leaving crop residue on the surface when crops are not grown, timely and limited tillage, and crop rotation. Incorporating crop residue into the soil also helps maintain favorable soil structure and tilth and water intake. Rows can be laid out in such a way as to remove excess surface water from some places. Drainage is needed in most areas.

This soil is well suited to improved pastures of bermudagrass and Gordo bluestem.

This soil is not suited to most urban and recreation uses because of the flood hazard.

This soil supports habitat for ducks and for deer, squirrel, swamp rabbit, other furbearing animals, and wild hogs. Nesting areas for quail, dove, and songbirds are plentiful.

This soil is in capability subclass IIw.

**Tr—Trinity clay, frequently flooded.** This deep, nearly level soil is on wide flood plains of major rivers. Areas are oblong and range from 50 to 1,000 acres. The surface of most areas is marked by partly filled old stream and scour channels. The slope ranges from 0 to 1 percent.

Typically, the surface layer is calcareous, moderately alkaline, very dark gray clay about 25 inches thick. From 25 to 80 inches is calcareous, moderately alkaline clay that is dark gray in the upper part, gray in the lower part, and mottled with brown throughout.

This soil is somewhat poorly drained. Permeability is very slow, and available water capacity is high. The soil cracks when dry. Water enters the soil rapidly until the cracks swell shut; then infiltration is very slow. Runoff is very slow, and the hazard of water erosion is slight except in areas subject to streambank caving. These soils are inundated 1 to 5 times annually for 1 to 10 days.



Included in mapping are small areas of Sinton, Rydolph, and Meguin soils. The included soils make up less than 10 percent of any mapped area.

This Trinity soil is used mainly as rangeland. In a few areas it is used as pastureland. It is in the Clayey Bottomland range site.

This soil is poorly suited to crops because of the flood hazard. It is well suited to improved pastures of kleingrass and Gordo bluestem.

This soil is not suited to most urban and recreation uses because of the flood hazard.

This soil supports habitat for duck and for deer, squirrels, swamp rabbit, other furbearing animals, and wild hogs. Nesting areas for quail, dove, and songbirds are plentiful.

This soil is in capability subclass Vw.

**VaD—Valco clay loam, 2 to 8 percent slopes.** This shallow, gently sloping to sloping soil is on the crest and sides of ridges. Areas are round and oblong and range up to 100 acres.

Typically, the surface layer is calcareous, moderately alkaline, very dark brown clay loam about 10 inches thick. From 10 to 15 inches is calcareous, moderately alkaline, dark grayish brown clay loam. From 15 to 17 inches is calcareous, moderately alkaline, weakly cemented caliche that has soil material along fractures and in old solution cavities. Below that, to a depth of 40 inches, is white, weakly cemented and soft, powdery caliche.

This soil is well drained. Permeability is moderate, and available water capacity is very low. Surface runoff is medium, and the hazard of water erosion is moderate to severe.

Included in mapping are small areas of Weesatche and Sarnosa soils. The included soils make up less than 20 percent of any mapped area.

This Valco soil is used mainly as rangeland. It is in the Shallow range site.

This soil is poorly suited to pastureland.

This soil is moderately well suited to most urban and recreation uses. The caliche and slope are the main limitations. These limitations can be overcome by good design and careful installation.

This soil supports habitat for deer, quail, and mourning dove. The habitat has ample cover and enough browse, mast, and seeds for a year-round food supply.

This soil is in capability subclass IVs.

**WeB—Weesatche sandy clay loam, 1 to 3 percent slopes.** This deep, gently sloping soil is on gently rolling uplands. Areas are irregular in shape and range from 10 to 200 acres.

Typically, the surface layer is neutral, black sandy clay loam about 7 inches thick. From 7 to 13 inches is mildly alkaline, very dark gray sandy clay loam. The subsoil from 13 to 35 inches is moderately alkaline, dark reddish

brown sandy clay loam. Below that, to a depth of 60 inches, is moderately alkaline, light brown loam.

This soil is well drained. Permeability is moderate, and available water capacity is medium. This soil has good tilth and can be worked over a wide range of moisture conditions. Runoff is medium, and the hazard of water erosion is slight.

Included in mapping are small areas of Sarnosa and Papalote soils. The included soils make up less than 20 percent of any mapped area.

This soil is used as cropland, pastureland, and rangeland. It is in the Clay Loam range site.

This soil is moderately well suited to crops. Grain sorghum and corn are the main crops. Good management includes leaving residue on the surface when crops are not grown, timely and limited tillage, and crop rotation. Growing cover crops and soil-improving crops and incorporating crop residue into the soil help control erosion and maintain productivity and tilth. Contour farming, terraces, and grassed waterways are needed to help control erosion. Fertilizer is needed for maximum crop production.

This soil is moderately well suited to improved pastures of bermudagrass and Gordo bluestem.

This soil is moderately well suited to most urban uses and is well suited to recreation uses. The main limitation to urban uses is the shrink-swell potential of the soil. This limitation can be overcome by good design and careful installation.

This soil supports habitat for deer, dove, quail, turkey, and songbirds. The habitat has ample cover and enough browse, mast, and seeds for a year-round food supply.

This soil is in capability subclass IIe.

**WeC—Weesatche sandy clay loam, 3 to 5 percent slopes.** This deep, gently sloping soil is on the crest and sides of broad ridges. Areas are oblong and follow the contour of the slope. They range from 10 to 300 acres.

Typically, the surface layer is mildly alkaline, black sandy clay loam about 7 inches thick. From 7 to 12 inches is moderately alkaline, dark reddish brown sandy clay loam. The subsoil from 12 to 17 inches is moderately alkaline, dark brown sandy clay loam. From 17 to 40 inches the subsoil is moderately alkaline, light brown clay loam. Below that, to a depth of 60 inches, is moderately alkaline, reddish yellow loam.

This soil is well drained. Permeability is moderate, and available water capacity is high. This soil has good tilth and can be worked over a wide range of moisture conditions. Runoff is medium, and the hazard of water erosion is moderate.

Included in mapping are small areas of Sarnosa and Papalote soils. The included soils make up less than 20 percent of any mapped area.

This soil is used as cropland, pastureland, and rangeland. It is in the Clay Loam range site.

This soil is moderately well suited to crops. Grain sorghum and corn are the main crops. Good management includes leaving residue on the surface when crops are not grown, timely and limited tillage, and crop rotation. Growing cover crops and soil-improving crops and incorporating crop residue into the soil help control erosion and maintain productivity and tilth. Contour farming, terraces, and grassed waterways are needed to help control erosion. Fertilizer is needed for maximum crop production.

This soil is moderately well suited to improved pastures of bermudagrass and Gordo bluestem.

This soil is moderately well suited to most urban and recreation uses. The main limitations are the shrink-swell potential and slope. These limitations can be overcome by good design and careful installation.

This soil supports habitat for deer, dove, quail, turkey, and songbirds. The habitat has ample cover and enough browse, mast, and seeds to supply food the year round.

This soil is in capability subclass IIIe.

**Za—Zalco fine sand, frequently flooded.** This deep, nearly level soil is on flood plains of major streams. The surface of most areas is marked by numerous low ridges and shallow scour channels. Areas are narrow, oblong, and crescent in shape, and they range from 40 to 500 acres. The slope ranges from 0 to 1 percent.

This soil is moderately alkaline, calcareous, stratified sandy and loamy material throughout. Typically, the

surface layer is brown fine sand about 4 inches thick. From 4 to 19 inches is stratified, brown fine sand; from 19 to 27 inches is grayish brown loamy fine sand; and from 27 to 37 inches is brown loamy fine sand. Below that, to a depth of 49 inches, is stratified, dark grayish brown fine sandy loam, and from 49 to 80 inches is brown fine sand.

This soil is somewhat excessively drained. Permeability is rapid, and available water capacity is low. Runoff is very slow, and the hazard of water erosion is slight except in areas subject to streambank caving. The soil is flooded 1 to 5 times annually for 1 to 5 days.

Included in mapping are areas of streambanks and recently water-washed sand in adjoining channels. Also included are small areas of Sinton and Meguin soils. The included soils make up less than 10 percent of any mapped area.

This soil is used as rangeland and pastureland. It is in the Sandy Bottomland range site.

This soil is poorly suited to crops because of the flood hazard. It is moderately well suited to improved pasture of lovegrass and Pensacola bahiagrass.

This soil is not suited to most urban and recreation uses because of the flood hazard.

This soil supports habitat for dove and deer, squirrel, and other furbearing animals. Nesting areas for dove and songbirds are plentiful.

This soil is in capability subclass Vw.

## prime farmland

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Prime farmland, as defined by the U.S. Department of Agriculture, is that land that is best suited to producing food, feed, forage, fiber, and oilseed crops. It has the soil quality, growing season, and moisture supply needed to economically produce sustained high crop yields if acceptable farming methods are used. Prime farmland produces the highest yields with minimal inputs of energy and money and farming it results in the least damage to the environment. Prime farmland is of major importance in satisfying the nation's short- and long-range needs for food and fiber. The supply of high quality farmland is limited, and it should be used with wisdom and foresight.

Prime farmland is either currently used for producing food or fiber or is available for this use. Urban or built-up land or water areas are not included. Urban and built-up land includes any unit of land of 10 acres or more that is used for residences, industrial sites, commercial sites, construction sites, institutional sites, railroad yards, small parks, cemeteries, airports, golf courses, sanitary landfills, sewage treatment plants, water-control structures and spillways, shooting ranges, and so forth.

Prime farmland usually has an adequate and dependable supply of moisture from precipitation or irrigation. It has favorable temperature and growing season and acceptable reaction. It has few or no rocks and is permeable to water and air. Prime farmland is not excessively erodible or saturated with water for long periods or flooded during the growing season. Slope ranges mainly from 0 to 5 percent.

About 152,830 acres, or about 27 percent of the land area in Victoria County, meet the requirements for prime farmland. Areas are scattered throughout the county. Approximately 135,000 acres of prime farmland is used

for cultivated crops, mainly grain sorghum, corn, and rice.

A recent trend in land use in some parts of the county is the loss of some prime farmland to urban and industrial uses. The loss of prime farmland to other uses puts pressure on marginal land, which generally is more erodible, droughty, and difficult to cultivate and less productive.

The soil map units that make up prime farmland in Victoria County are listed in this section. This list does not constitute a recommendation for a particular land use. The extent of each map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The use and management of the soils is described in the section "Detailed soil map units."

The map units in the following list are prime farmland:

- FaA—Faddin fine sandy loam, 0 to 1 percent slopes
- FaB—Faddin fine sandy loam, 1 to 3 percent slopes
- FaC—Faddin fine sandy loam, 3 to 5 percent slopes
- LaA—Lake Charles clay, 0 to 1 percent slopes
- LaB—Lake Charles clay, 1 to 3 percent slopes
- Me—Meguin silty clay, occasionally flooded
- PaB—Papalote fine sandy loam, 1 to 3 percent slopes
- RaB—Runge fine sandy loam, 0 to 2 percent slopes
- RaC—Runge fine sandy loam, 2 to 5 percent slopes
- Rd—Rydolph silty clay, occasionally flooded
- Sn—Sinton loam, occasionally flooded
- To—Trinity clay, occasionally flooded
- WeB—Weesatche sandy clay loam, 1 to 3 percent slopes
- WeC—Weesatche sandy clay loam, 3 to 5 percent slopes





## use and management of the soils

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This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

### crops and pasture

Ronald D. Colburne, district conservationist, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated

yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

In 1967, more than 120,000 acres in the survey area was used as cropland (12). Of this total, 87,000 acres was used for row crops, mainly grain sorghum and corn; 13,000 acres was used for close-growing crops, mainly gulf ryegrass, wheat, and oats; 6,000 acres was used for irrigated riceland; and 5,200 acres was in small grain and forage sorghum used for hay and pasture. The rest was in temporarily idle cropland and summer fallow.

Land use is constantly changing in Victoria County. Rangeland is being converted to cropland, and some cropland is being converted to pastureland. The acreage in rangeland, pastureland, and cropland has gradually been decreasing as more land is used for urban and built-up areas, small ranches, and rural subdivisions. This soil survey can help make land use decisions that will influence the future role of farming and ranching in the county.

The potential of the soils in the county for increased production of food is high. About 28,000 acres of potentially good or fair cropland is currently used as pastureland and hayland, and about 134,000 acres is used as rangeland. Most of this cropland would require drainage, land leveling or smoothing, grade stabilization structures, or erosion control practices for sustained economical production. Food production could also be increased by the use of the latest crop production technology on all cropland in the county.

*Soil drainage* is the major concern on about 95 percent of the cropland in the county. Surface runoff is very slow to slow on most soils. The nearly level, poorly drained Edna, Nada, and Cieno soils and the nearly level, somewhat poorly drained Dacosta, Lake Charles, Telferner, and Trinity soils need shallow surface field drains and large drainage outlets to remove excess water during wet periods.

*Soil erosion* is a major concern on only about 5 percent of the cropland, pastureland, and hayland. If slope is more than 1 percent, erosion is a potential

hazard. Edna, Papalote, Straber, Telferner, Valco, and Weesatche soils have slope of 1 to 5 percent.

Loss of the surface layer through erosion is damaging for two reasons. Productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging to soils that have a clayey subsoil, such as Edna, Papalote, and Straber soils, and to shallow soils such as Valco soils, which have a limited root zone. Erosion also reduces productivity on soils that tend to be droughty, such as Edna and Straber soils. Also, soil erosion on farmland results in sedimentation of streams. Controlling erosion minimizes the pollution of streams by sediment and improves the water quality for municipal use, for recreation, and for fish and wildlife.

Erosion is controlled by providing surface cover, reducing runoff, and increasing infiltration. On most sloping soils, the soil is kept in permanent vegetation of improved pasture grasses or native range.

On the sloping cropland, a cropping system that keeps a plant cover on the soil for extended periods can hold soil loss to an amount that will not reduce the productive capacity of the soil. Terraces and diversions, which reduce the length of slope and reduce runoff and erosion, are most practical on deep soils that have regular slopes. Most deep, sloping soils in Victoria County are suitable for terraces and diversions. Contour farming is practiced on all the terraced land in the survey area.

In some small areas slopes are so short and irregular that contour tillage or terracing is not practical. In these areas, cropping systems that provide substantial plant cover are needed for erosion control unless minimum tillage is practiced. Minimizing tillage and leaving crop residue on the surface help to increase infiltration and reduce runoff and erosion. These practices can be adapted to most soils in the survey area but are more difficult to use successfully on the eroded soils.

*Natural fertility* is high in most of the soils that formed on the flood plains. Except for the sandy Valco soils, the soils on flood plains are naturally higher in plant nutrients than most of the soils on uplands.

The upland soils that formed under prairie vegetation are moderately high to high in plant nutrients. These soils have a loamy to clayey surface layer that ranges from medium acid to moderately alkaline. The lower horizons range from neutral to moderately alkaline. The clayey soils generally have medium to high levels of phosphorus and potash. The loamy soils commonly have low to medium levels of phosphorus and potash. Lime is seldom needed.

Nitrogen and phosphorus are needed for most crops and for all improved pasture grasses. For very high yields of pasture and hay, frequent applications may be needed. Additions of lime and fertilizer should be based on the results of soil tests, on the needs of the crop, and on the expected yields. The Cooperative Extension

Service can help in determining the kinds and amounts of fertilizer and lime to apply.

*Tilth* is an important factor in the germination of seeds and in the infiltration of water into the soil. Soils that have good tilth are granular and porous.

Tilth is a concern on the dark, clayey Lake Charles and Trinity soils because the soils often stay wet until late in spring. If they are wet when plowed, they tend to be very cloddy when dry, and a good seedbed is difficult to prepare.

Tilth is also a concern on the dark, loamy Dacosta soils. These soils are hard and massive when dry and tend to form a thick surface crust. The crust is hard and nearly impervious to water when dry. Surface crusting reduces infiltration and increases runoff. Regular additions of crop residue, manure, and other organic material can help to improve soil structure and to reduce crusting. Fall plowing generally results in good tilth in spring.

The Edna, Telferner, Nada, and Papalote soils have a loamy surface layer that is light in color and low in organic matter content. Generally these soils have weak structure, and intense rainfall causes crusting of the surface. These soils often form a crust during winter if they become dry. Many of these soils may be nearly as dense and hard at planting time after fall plowing as they were before plowing. Regular additions of crop residue, manure, and other organic material can help to improve soil structure and to reduce crusting. Fall plowing is necessary for seedbed preparation in case winters are very wet. Other tillage practices may be needed to prevent crusting.

*Field crops* suited to the soils and climate of the survey area include many that are not now commonly grown. Grain sorghum and corn are the chief row crops. Cotton, sunflowers, and soybeans can be grown.

About 17,000 acres in Victoria County is used for rice, and about 200,000 more acres is suitable for this crop. Each year, only about one-third of the acreage is planted to rice; the rest is grazed by livestock. A mixture of gulf ryegrass and common bermudagrass is often seeded at harvest time for livestock. Residual fertilizer from the rice is used in lieu of additional fertilizer.

Irrigation water is supplied by deep wells. The acreage planted to rice each year is directly related to the number and strength of the irrigation wells.

Gulf ryegrass, wheat, and oats are the common close-growing crops. A small acreage of flax is planted each year.

*Special crops* grown commercially in the survey area are vegetables, tree fruits, and nursery plants. A small acreage is used for cucumbers, turnips, sweet corn, tomatoes, peas, beans, and other vegetables and small fruits. Large areas are suited to other special crops such as peaches, plums, and many vegetables.

Deep loamy soils that have good natural drainage are especially well suited to many vegetables, nursery plants,



tree fruits, and small fruits. Examples are Degola, Papalote, Runge, Sarnosa, Sinton, Straber, and Weesatche soils that have slope of less than 5 percent. Pecan trees are suited to most of the soils in the survey area; they are well suited to the well drained and moderately well drained soils on flood plains.

*Pastureland and hayland* make up about 4 percent of the acreage. Improved pastures consist of perennial warm-season species of bermudagrass, Gordo bluestem, and kleingrass. There are small acreages of Pensacola bahiagrass, lovegrass, King Ranch bluestem, and johnsongrass and of cool-season legumes such as Hubam clover, arrowleaf clover, and burclover. The legumes are normally planted in pure stands or with a small grain. Bermudagrass, which is suited to most soils in the survey area, and Gordo bluestem, suited to heavy clays and clay loams, make up the most common improved pastures.

The amount of beef produced is directly related to the amount of forage produced. Well-managed pastureland has one main grass that is well watered and free of weeds. It is fertilized according to plant needs, desired production, and soil tests. Mowing, shredding, or using chemical herbicides helps to control weeds. Well-managed stands of grasses tend to eliminate most weeds. Pastureland should be stocked according to the amount of forage available and grazed only to a height that permits plants to remain vigorous. A good grass cover helps to prevent erosion, winterkill, and soil compaction and to insure rapid growth in spring.

Temporary improved pasture is often used to supplement permanent improved pasture. Sudangrass, johnsongrass, and sorghum-sudangrass hybrids make good supplemental improved pasture in summer. Small grain provides good supplemental winter forage.

Hay in the survey area is mainly bermudagrass or Gordo bluestem; a small acreage is mixed tall climax prairie grasses.

Management of hay requires timely mowing to insure high quality, maximum production, and plant vigor. Hay should be cut to a height that is best for the plants. Mowing too low or too often damages the grasses, as overgrazing damages pastureland. Mowing at the proper height helps to maintain plant vigor and leaves residue on the surface to help control erosion and maintain organic matter content. The harvesting of crops on wet soil tends to pack the surface layer, causing excessive runoff and poor plant growth. Weeds can be controlled by mowing, shredding, or using herbicides.

Native hay should not be cut if it is seriously damaged by drought, fire, or poor management. It should be allowed to make a full season's growth for a year or more so that the grasses can reestablish a strong root system and regain their vigor. Weakened grasses are easily winterkilled and invaded by weeds.

Well established native grasses generally can be kept vigorous without the use of fertilizer if they are well managed.

### **yields per acre**

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

### **land capability classification**

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland and for engineering purposes.



In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

*Capability classes*, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use. (None in the county.)

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production. (None in the county.)

*Capability subclasses* are soil groups within one class. They are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w*, *s*, or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is shown in table 6. The capability classification of each map unit is given in the section "Detailed soil map units."

## rangeland

Rangeland is land on which native vegetation consists of a wide variety of grasses, grasslike plants, forbs, shrubs, and trees. The kinds of vegetation are generally

suitable for grazing and are found in sufficient amounts to justify grazing use. Rangeland, or native grassland, receives no regular or frequent cultural treatment. The composition or production of the plant community is determined by soil, climate, topography, overstory canopy, and grazing management.

About 68 percent of the survey area is rangeland. Most of the county is an open treeless prairie. This prairie originally produced a wide variety of tall and mid grasses interspersed with an abundance of forbs. The northern and northwestern parts of the county formed a savannah characterized by tall grasses, forbs, post oak, blackjack oak, and live oak.

The plant community of Victoria County has changed drastically over the past 100 years. Because of heavy grazing, most grassland has deteriorated, and much of the higher quality vegetation has been grazed out. Tall grasses now flourish only in a few places. In most places, they have been replaced by a mixture of short and mid grasses and poor-quality forbs. However, remnants of the original plants still grow on most protected grassland. In these areas, good grazing management will allow the high-quality plants to re-establish themselves on rangeland.

Rangeland in Victoria County varies from a small acreage on farms to very large ranches. With a few exceptions, the rangeland is used for cow-calf production. Forage production on the small- to medium-sized ranges is often supplemented by improved pastureland and small grain. About 75 percent of the total acreage of rangeland is on units of 640 acres or more, and the forage is composed almost entirely of native vegetation. Supplemental feeding of protein concentrate and hay is needed in winter. Phosphorus and other minerals need to be fed to cattle year round.

Approximately 70 percent of the annual growth is produced in April, May, and June, when rains and moderate temperatures favor the growth of warm-season plants. A secondary growth period is usually in September and October, when fall rains and gradually cooling temperatures are common.

Range management requires a knowledge of the kinds of soil and of the climax vegetation. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the climax vegetation on a particular range site. The more closely the existing community resembles the climax vegetation, the better the range condition.

A primary objective of good range management is to keep range in excellent or good condition so as to conserve water, improve yields, and protect the soil. The main management concern is recognizing important changes in the kind of cover on a range site. These changes take place gradually and can be misinterpreted or overlooked. Growth encouraged by heavy rainfall may lead to the conclusion that the range is in good

condition, when actually the cover is weedy and the long-term trend is toward lower production. On the other hand, some rangeland that has been closely grazed for short periods, under careful supervision, may have a degraded appearance that temporarily conceals its quality and ability to recover.

### **range sites and condition classes**

A range site is a distinctive kind of rangeland that produces a characteristic vegetation that differs from the climax vegetation on other range sites in kind, amount, and proportion of range plants. Soils that produce about the same kinds and amounts of forage make up a range site. Soil properties that affect moisture supply and plant nutrients have the most influence on productivity. Soil reaction, salt content, and a seasonal high water table are also important.

Climax vegetation on the range site is the stabilized plant community that reproduces itself and changes very little so long as the environment remains unchanged. Throughout the area, the climax vegetation consists of the plants that grew there when it was first settled. The most productive combination of forage plants on a range site is generally the climax vegetation.

Decreasers are plants in the climax vegetation that tend to decrease in relative amount under close grazing. They generally are the tallest and most productive perennial grasses and forbs and the most palatable to livestock.

Increasers are plants in the climax vegetation that increase in relative amount as the more desirable decreaseers are reduced by close grazing. They are commonly shorter than decreaseers and are generally less palatable to livestock.

Invaders are plants that cannot compete with the climax vegetation for moisture, nutrients, and light. Hence, invaders come in and grow along with increasers after the climax vegetation has been reduced by grazing.

Range condition is judged according to standards that apply to the particular range site. It expresses the present kind and amount of vegetation in relation to the climax plant community for that site.

Four range condition classes are used to indicate the degree of departure from the potential, or climax, vegetation brought about by grazing or other uses. The classes show the present condition of the native vegetation on a range site in relation to the native vegetation that could grow there. A range is in excellent condition if 76 to 100 percent of the vegetation is of the same kind as that in the climax stand; in good condition if the percentage is 51 to 75; in fair condition if the percentage is 26 to 50; and in poor condition if the percentage is 25 or less.

Potential forage production depends on the range site. Current forage production depends on the range condition and the moisture available to plants during their growing season.

Following years of prolonged overuse of range, seed sources of desirable vegetation will be eliminated. In such instances, vegetation can be re-established by applying one or a combination of the following practices: brush control, range seeding, fencing, water development, or other mechanical treatment to revitalize stands of native plants. Thereafter, deferred grazing, proper grazing use, and planned grazing systems must be applied to maintain and improve the range.

Good management generally results in the optimum production of vegetation, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs.

Table 7 shows, for each soil, the range site and the potential annual production of vegetation in favorable, average, and unfavorable years. Only those soils that are suited to rangeland are listed.

*Potential annual production* is the amount of vegetation that can be expected to grow annually on well managed rangeland supporting the climax vegetation. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, average, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

There are 19 range sites in the survey area. They are Blackland, Clay Loam, Clayey Bottomland, Claypan Prairie, Deep Sand, Gravelly, Gray Sandy Loam, Loamy Bottomland, Loamy Prairie, Lowland, Rolling Blackland, Salt Marsh, Salty Prairie, Sandy, Sandy Bottomland, Sandy Loam, Sandy Prairie, Shallow, and Tight Sandy Loam.

**Blackland range site.** The Contee, Dacosta, and Lake Charles soils, in map units DaA, DaB, DnA, DvC, LaA, LaB, and LaD, are in the Blackland range site. The climax vegetation is a true prairie. The composition by weight is about 95 percent grasses and 5 percent forbs.

About 75 percent of the climax vegetation is made up of little bluestem and indiangrass. The other grasses are switchgrass, brownseed paspalum, Virginia wildrye, Texas wintergrass, longtom, and meadow dropseed. Forbs include sensitive brier, Maximilian sunflower, bundleflower, and dotted gayfeather.

If regression occurs, as a result of heavy grazing, little bluestem, indiangrass, switchgrass, and Maximilian sunflower are replaced by brownseed paspalum and meadow dropseed. If heavy grazing continues for many years, woody plants such as huisache, baccharis, Macartney rose, and sennabeen increase significantly



with understory plants such as bushybeard bluestem, broomsedge bluestem, vaseygrass, carpetgrass, smutgrass, buffalograss, and fogfruit.

**Clay Loam range site.** The Weesatche soil in map units WeB and WeC is in the Clay Loam range site. The climax vegetation is a true prairie that has a few trees in motts and along draws. The composition by weight is about 85 percent grasses, 10 percent woody plants, and 5 percent forbs.

About 75 percent of the climax vegetation is made up of little bluestem, silver bluestem, and southwestern bristlegrass. The other grasses are brownseed paspalum, sideoats grama, buffalograss, and perennial threeawn. Woody plants include mesquite, condalia, spiny hackberry, and Texas colubrina. Forbs include Engelmann-daisy, orange zexmania, Mexican sagewort, bushsunflower, and sensitive brier.

If regression occurs, as a result of heavy grazing, little bluestem is replaced by silver bluestem, southwestern bristlegrass, brownseed paspalum, sideoats grama, buffalograss, and perennial threeawn. If heavy grazing continues for many years, mesquite, spiny hackberry, and other mixed brush form a dense canopy, and purple threeawn, huisache, ragweed, cotton, and common bahiagrass increase significantly.

**Clayey Bottomland range site.** The Trinity soils in map units To and Tr are in the Clayey Bottomland range site. The climax vegetation is a tall grass savannah. The composition by weight is about 75 percent grasses, 20 percent woody plants, and 5 percent forbs.

About 55 percent of the climax vegetation is made up of switchgrass, indiangrass, eastern gamagrass, little bluestem, big bluestem, and Florida paspalum. The other grasses are Virginia wildrye, beaked panicum, rustyseed paspalum, buffalograss, broadleaf uniola, knotroot bristlegrass, and low panicum. Woody plants include oak, elm, cottonwood, water elm, hackberry, black willow, pecan, hawthorn, and woody vines. Forbs include perennial legumes, tickclover, gayfeather, and spiny aster.

If regression occurs, as a result of heavy grazing, switchgrass, indiangrass, eastern gamagrass, little bluestem, big bluestem, and Florida paspalum are replaced by Virginia wildrye, sedges, beaked panicum, and rustyseed panicum. If heavy grazing continues for many years, woody plants such as oak, elm, cottonwood, and water elm form a dense stand. The understory plants are broomsedge, bushy bluestem, smutgrass, carpetgrass, bitter sneezeweed, baccharis, sennabean, and palmetto.

**Claypan Prairie range site.** The Edna and Nada soils in map units EdA, EdB, and NcA are in the Claypan Prairie range site. The climax vegetation is a true prairie.

The composition by weight is about 95 percent grasses and 5 percent forbs.

About 60 percent of the climax vegetation is made up of little bluestem, switchgrass, and indiangrass. The other grasses are eastern gamagrass, Florida paspalum, big bluestem, brownseed paspalum, low panicums, low-paspalums, longtom, knotroot bristlegrass, and sedges. Forbs include bundleflower, sensitive brier, button snakeroot, yellow neptunia, croton, and ragweed.

If regression occurs, as a result of heavy grazing, little bluestem, switchgrass, indiangrass, big bluestem, eastern gamagrass, and Florida paspalum are replaced by brownseed paspalum, low paspalums and panicums, knotroot bristlegrass, and sedges. If heavy grazing continues for many years, smutgrass, carpetgrass, common bermudagrass, bushybeard bluestem, broomsedge bluestem, vaseygrass, and woody species such as Macartney rose, sennabean, huisache, running live oak, and baccharis increase significantly.

**Deep Sand range site.** The Kuy and Rupley soils in map units KyC and RbC are in the Deep Sand range site. The climax vegetation is a tall grass, post oak, and live oak savannah with a canopy of about 20 percent. The composition by weight is about 80 percent grasses, 15 percent woody plants, and 5 percent forbs.

About 60 percent of the climax vegetation is made up of little bluestem and indiangrass. The other grasses are purpletop, southwestern bristlegrass, brownseed paspalum, and Pan American balsamscale. Woody plants include post oak and live oak. Forbs include snoutbean, wildbean, and tickclover.

If regression occurs, as a result of heavy grazing, little bluestem and indiangrass are replaced by purpletop, southwestern bristlegrass, and brownseed paspalum. If heavy grazing continues for many years, red lovegrass, yankeeweed, bullnettle, and Pan American balsamscale increase significantly. Oak, yaupon, hawthorns, greenbrier, American beautyberry, waxmyrtle, and berry vines may form dense thickets.

**Gravelly range site.** The Goldmire, Silvern, and Tremona soils, in map units GdC, SkC, and TgC, are in the Gravelly range site. The climax vegetation is a savannah made up of tall grass, post oak, and blackjack oak with a canopy of 15 to 20 percent. The composition by weight is about 80 percent grasses, 15 percent woody plants, and 5 percent forbs.

About 65 percent of the climax vegetation is made up of little bluestem, indiangrass, switchgrass, beaked panicum, and purpletop. The other grasses are brownseed paspalum, sideoats grama, purple lovegrass, low panicums, silver bluestem, and arrowfeather threeawn. Woody plants include post oak, blackjack oak, elm, American beautyberry, yaupon, greenbrier, grape, and berry vines. Forbs include tickclover, bundleflower, sensitive brier, wildbean, snoutbean, and partridgepea.



If regression occurs, as a result of heavy grazing, little bluestem, indiangrass, switchgrass, beaked panicum, and purpletop are replaced by brownseed paspalum and woody plants such as oak, yaupon, greenbrier, hawthorns, and American beautyberry. If heavy grazing continues for many years, annual grasses and weeds, red lovegrass, splitbeard bluestem, broomsedge bluestem, wild indigo, bitter sneezeweed, baccharis, and sennabeen increase significantly.

**Gray Sandy Loam range site.** The Sarnosa soil in map unit SaB is in the Gray Sandy Loam range site. The climax vegetation is an open grassland that has scattered mesquite and underbrush. The composition by weight is about 85 percent grasses, 10 percent woody plants, and 5 percent forbs.

About 55 percent of the climax vegetation is made up of little bluestem, indiangrass, and brownseed paspalum. The other grasses are sideoats grama, silver bluestem, fall witchgrass, plains lovegrass, hooded windmillgrass, buffalograss, knotroot bristlegrass, and perennial threeawn. Woody plants include mesquite, blackbrush, spiny hackberry, condalia, Texas persimmon, and kidneywood. Forbs include snoutbean, bundleflower, sensitive brier, bushsunflower, and orange zexmania.

If regression occurs, as a result of heavy grazing, little bluestem and indiangrass are replaced by silver bluestem, brownseed paspalum, sideoats grama, fall witchgrass, plains lovegrass, hooded windmillgrass, and buffalograss. Woody plants such as mesquite, blackbrush, spiny hackberry, condalia, and other shrubs form a dense canopy. If heavy grazing continues for many years, threeawn, croton, bitter sneezeweed, ragweed, broomweed, grassbur, and huisache increase significantly.

**Loamy Bottomland range site.** The Degola, Meguin, Rydolph, and Sinton soils, in map units Dw, Me, Mf, Rd, Rf, and Sn, are in the Loamy Bottomland range site. The climax vegetation is a tall grass savannah. The composition by weight is about 75 percent grasses, 20 percent woody plants, and 5 percent forbs.

About 65 percent of the climax vegetation is made up of eastern gamagrass, indiangrass, switchgrass, rustyseed paspalum, Virginia wildrye, beaked panicum, and sedges. The other grasses are little bluestem, big bluestem, broadleaf uniola, longtom, and knotroot bristlegrass. Woody plants include pecan, hackberry, oak, elm, and cottonwood. Forbs include snoutbean, lespedeza, wildbean, and spiny aster.

If regression occurs, as a result of heavy grazing, eastern gamagrass, indiangrass, switchgrass, and big bluestem are replaced by little bluestem, snoutbean, wildbean, and Virginia wildrye. If heavy grazing continues for many years, woody plants such as oaks, pecans, and hackberry will form a dense stand. The understory plants include common bermudagrass, rustyseed paspalum,

sedges, low panicums and paspalums, blood ragweed, cocklebur, white crownbeard, and sumpweed.

**Loamy Prairie range site.** The Faddin and Telferner soils of map units DvC, FaA, FaB, FaC, TeA, and TeB are in the Loamy Prairie range site. The climax vegetation is a true prairie. The composition by weight is about 95 percent grasses and 5 percent forbs.

About 60 percent of the climax vegetation is made up of little bluestem. The other grasses are indiangrass, switchgrass, Florida paspalum, big bluestem, Virginia wildrye, brownseed paspalum, Pan American balsamscale, fringeleaf paspalum, longtom, sedges, low panicums, and knotroot bristlegrass. Forbs include Maximilian sunflower, bundleflower, sensitive brier, and yellow neptunia.

If regression occurs, as a result of heavy grazing, little bluestem and Florida paspalum are replaced by brownseed paspalum, slender bluestem, low panicums, knotroot bristlegrass, common bermudagrass, sedges, and longspike tridens. If heavy grazing continues for many years, smutgrass, carpetgrass, Pan American balsamscale, broomsedge bluestem, common bahiagrass, and woody plants such as Macartney rose, running live oak, and huisache increase significantly.

**Lowland range site.** The Cieno soil in map unit NcA is in the Lowland range site. The climax vegetation is a wet prairie. The composition by weight is about 95 percent grasses and 5 percent forbs.

About 80 percent of the climax vegetation is made up of switchgrass, indiangrass, Florida paspalum, little bluestem, big bluestem, and eastern gamagrass. The other grasses are brownseed paspalum, knotroot bristlegrass, longtom, sedges, low panicums, low paspalums, broomsedge, and bushybeard bluestem. Forbs include sensitive brier, bundleflower, button snakeroot, and Maximilian sunflower.

If regression occurs, as a result of heavy grazing, switchgrass, indiangrass, eastern gamagrass, little bluestem, big bluestem, and Maximilian sunflower are replaced by longtom, brownseed paspalum, broomsedge and bushy bluestem, knotroot bristlegrass, sedges, and low panicums. If heavy grazing continues for many years, plants such as vaseygrass, carpetgrass, smutgrass, common bahiagrass, baccharis, and sennabeen increase significantly.

**Rolling Blackland range site.** The Denhawken and Elmendorf soils in map unit DxB are in the Rolling Blackland range site. The climax vegetation is a true prairie. A few trees grow in motts and along draws. The composition by weight is about 90 percent grasses, 5 percent forbs, and 5 percent woody plants.

About 70 percent of the climax vegetation is made up of little bluestem, indiangrass, and big bluestem. The other grasses are eastern gamagrass, switchgrass,



wildrye, sideoats grama, silver bluestem, Texas wintergrass, tall dropseed, meadow dropseed, fall witchgrass, and buffalograss. Forbs include Maximilian sunflower, Engelmann-daisy, gayfeather, bundleflower, sensitive brier, western indigo, snoutbean, and vetch. Woody plants include live oak, elm, hackberry, and bumelia.

If regression occurs from heavy use, little bluestem, indiagrass, big bluestem, eastern gamagrass, and Maximilian sunflower are replaced by sideoats grama, silver bluestem, wildrye, and forbs such as bundleflower, wildbean, snoutbean, and fern acacia. Under continuous heavy grazing for many years, buffalograss, Texas wintergrass, and ragweed, croton, broomweed, snow-on-the-mountain, and other composites will increase along with a few scattered woody plants such as bumelia, live oak, elm, and hackberry.

**Salt Marsh range site.** The Aransas and Placedo soils in map units Ar and Pe are in the Salt Marsh range site. The climax vegetation is on marshland. The composition by weight is about 95 percent grasses and 5 percent forbs.

About 70 percent of the climax vegetation is made up of gulf cordgrass. The other grasses are little bluestem, common reed, seashore paspalum, switchgrass, seashore saltgrass, knotroot bristlegrass, longtom, and bulrushes. Forbs include slim aster, sumpweed, and bushy sea-oxeye.

If regression occurs, as a result of heavy grazing, little bluestem, switchgrass, and common reed are replaced by gulf cordgrass, seashore paspalum, and seashore saltgrass. Under continuous heavy grazing for many years, common invaders such as spiny aster, alligatorweed, and sennabeen will dominate the plant community.

**Salty Prairie range site.** The Austwell soil in map unit Au is in the Salty Prairie range site. The climax vegetation is a salty prairie. The composition by weight is about 95 percent grasses and 5 percent forbs.

About 75 percent of the climax vegetation is made up of gulf cordgrass. Other grasses are switchgrass, indiagrass, little bluestem, common reed, knotroot bristlegrass, longtom, seashore saltgrass, and shoregrass. Forbs include bushy sea-oxeye and slim aster.

If regression occurs, as a result of heavy grazing, bluestem, switchgrass, indiagrass, and common reed are replaced by gulf cordgrass, bermudagrass, red lovegrass, pickleweed, croton, bitter sneezeweed, and matrimonyvine.

**Sandy range site.** The Leming soil in map unit LmB is in the Sandy range site. The climax vegetation is a tall grass savannah that has a canopy of 25 to 35 percent.

The composition by weight is about 70 percent plants, 25 percent trees, and 5 percent forbs.

About 55 percent of the climax vegetation is made up of little bluestem, switchgrass, Florida paspalum, indiagrass, and purpletop. The other grasses are brownseed paspalum, tall dropseed, silver bluestem, low panicums, low paspalums, Texas wintergrass, and sedges. Among the woody plants are post oak, live oak, blackjack oak, yaupon, American beautyberry, and greenbrier. Forbs include partridgepea, bundleflower, snoutbean, wildbean, and sensitive brier.

If regression occurs, as a result of heavy grazing, little bluestem, indiagrass, purpletop, and switchgrass are replaced by brownseed paspalum and woody plants such as running live oak, post oak, and blackjack oak. Oak, elm, American beautyberry, greenbrier, yaupon, and associated woody plants generally increase until the community resembles a scrub forest. The understory is shade-tolerant herbaceous plants such as sedges and low panicums. If heavy grazing continues for many years, broomsedge, bluestem, red lovegrass, sandbur, wild indigo, bitter sneezeweed, yankeeweed, and sennabeen increase significantly.

**Sandy Bottomland range site.** The Zalco soil in map unit Za is in the Sandy Bottomland range site. The climax vegetation is a tall grass savannah. The composition by weight is about 75 percent grasses, 20 percent woody plants, and 5 percent forbs.

About 75 percent of the climax vegetation is made up of switchgrass, little bluestem, big bluestem, indiagrass, Virginia wildrye, purpletop, knotroot, and bristlegrass. Woody plants include cottonwood, hackberry, live oak, and willows. Forbs include partridgepea, American snoutbean, and sensitive brier.

If regression occurs, as a result of heavy grazing, switchgrass, little bluestem, indiagrass, Virginia wildrye, and purpletop are replaced by balsamscale, knotroot bristlegrass, and red lovegrass. If heavy grazing continues for many years, mesquite, grassbur, bull nettle, willows, and hairy grama increase significantly.

**Sandy Loam range site.** The Garcitas, Inez, Runge, and Straber soils, in map units GaC, InB, RaB, RaC, StB, and StC, are in the Sandy Loam range site. The climax vegetation is a tall grass savannah with a canopy of 20 to 35 percent. The composition by weight is about 70 percent grasses, 25 percent woody plants, and 5 percent forbs.

About 55 percent of the climax vegetation is made up of little bluestem, switchgrass, Florida paspalum, indiagrass, and purpletop. The other grasses are brownseed paspalum, tall dropseed, silver bluestem, low panicums, low paspalums, Texas wintergrass, and sedges. Among the woody plants are post oak, live oak, blackjack oak, yaupon, American beautyberry, and



greenbrier. Forbs include partridgepea, bundleflower, snoutbean, wildbean, and sensitive brier.

If regression occurs, as a result of heavy grazing, little bluestem, indiagrass, purpletop, and switchgrass are replaced by brownseed paspalum and woody plants such as running live oak, post oak, and blackjack oak. Oak, elm, American beautyberry, greenbrier, yaupon, and associated woody plants generally increase until the community resembles a scrub forest that has an understory of shade-tolerant, herbaceous plants such as sedges and low panicums. If heavy grazing continues for many years, broomsedge bluestem, red lovegrass, sandbur, wild indigo, bitter sneezeweed, yankeeweed, and sennabean increase significantly.

**Sandy Prairie range site.** The Fordtran soil in map unit FoB is in the Sandy Prairie range site. The climax vegetation is a true prairie. The composition by weight is about 95 percent grasses and 5 percent forbs.

About 75 percent of the climax vegetation is made up of little bluestem, indiagrass, crinkleawn, and big bluestem. The other grasses are eastern gamagrass, Florida paspalum, switchgrass, brownseed paspalum, knotroot bristlegrass, low panicums, fringeleaf paspalum, sedges, slender bluestem, and Pan American balsamscale. Forbs include Maximilian sunflower, sensitive brier, bundleflower, and yellow neptunia.

If regression occurs, as a result of heavy grazing, little bluestem, indiagrass, crinkleawn, switchgrass, big bluestem, eastern gamagrass, and Maximilian sunflower are replaced by brownseed paspalum, knotroot bristlegrass, low panicums, slender bluestem, and sedges. If heavy grazing continues for many years, smutgrass, carpetgrass, red lovegrass, broomsedge, bluestem, yankeeweed, bitter sneezeweed, and woody plants such as Macartney rose, huisache, sennabean, and running live oak increase significantly.

**Shallow range site.** The Valco soil in map unit VaD is in the Shallow range site. The climax vegetation is a prairie with scattered woody plants. The composition by weight is about 80 percent grasses, 10 percent woody plants, and 10 percent forbs.

About 50 percent of the climax vegetation is made up of silver bluestem, sideoats grama, little bluestem, and southwestern bristlegrass. The other grasses are plains lovegrass, buffalograss, Texas wintergrass, slim tridens, hooded windmillgrass, fall witchgrass, and perennial threeawn. Woody plants include kidneywood, blackbrush, spiny hackberry, Texas colubrina, clematis, condalia, and persimmon. Forbs include orange zexmania, bushsunflower, Engelmann-daisy, bundleflower, and sensitive brier.

If regression occurs, as a result of heavy grazing, little bluestem, silver bluestem, and sideoats grama are replaced by southwestern bristlegrass, plains lovegrass, Texas wintergrass, hooded windmillgrass, perennial

threeawn, and woody plants such as blackbrush, spiny hackberry, Texas colubrina, and persimmon. If heavy grazing continues for many years, mesquite and huisache increase significantly.

**Tight Sandy Loam range site.** The Papalote soil in map unit PaB is in the Tight Sandy Loam range site. The climax vegetation is mid grasses and scattered mixed brush. The composition by weight is about 80 percent grasses, 10 percent woody plants, and 10 percent forbs.

About 50 percent of the climax vegetation is made up of little bluestem, silver bluestem, sideoats grama, and southwestern bristlegrass. The other grasses are hooded windmillgrass, fall witchgrass, plains lovegrass, hairy grama, perennial threeawn, and buffalograss. Woody plants include mesquite, bumelia, kidneywood, condalia, and spiny hackberry. Forbs include sunflower, orange zexmenia, Engelmann-daisy, and other perennial legumes.

If regression occurs, as a result of heavy grazing, little bluestem is replaced by silver bluestem, sideoats grama, southwestern bristlegrass, plains lovegrass, buffalograss, and fall witchgrass. Under continuous heavy grazing for many years, mesquite, condalias, spiny hackberry, persimmon, and other woody plants form a moderately dense canopy.

## recreation

The soils of the survey area are rated in table 8 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 8, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 8 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

*Camp areas* require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

*Picnic areas* are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

*Playgrounds* require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

*Paths and trails* for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

## wildlife habitat

The major game species in the survey area are white-tailed deer, bobwhite quail, mourning dove, fox squirrel, swamp and cottontail rabbit, raccoon, and during migration, many species of ducks and geese. The peregrine falcon and bald eagle are in the area during migration.

The habitat includes openland mainly in crops, rangeland, wetland, and woodland along creeks and streams.

Attwater prairie chicken and alligator are endangered species that inhabit the county. Turkey and pheasant have been stocked and are increasing rapidly.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can

be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 9, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

*Grain and seed crops* are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are grain sorghum, corn, oats, barley, and rice.

*Grasses and legumes* are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are kleingrass, lovegrass, and clover.

*Wild herbaceous plants* are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, prairie senna, snoutbean, indiagrass, paspalum, and panicum.



*Hardwood trees* and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, pecan, hackberry, cottonwood, elm, hawthorn, and hickory.

*Coniferous plants* furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, cedar, and juniper.

*Shrubs* are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are yaupon, greenbrier, American beautyberry, and honeysuckle. Examples of fruit-producing shrubs and vines suitable for planting on soils rated *good* are Russian-olive, wild plum, and mustang grape.

*Wetland plants* are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, sesbania, maidencane, baccharis, longtom, cordgrass, rushes, sedges, and reeds.

*Shallow water areas* have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

*Habitat for openland wildlife* consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

*Habitat for woodland wildlife* consists of areas of deciduous plants and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

*Habitat for wetland wildlife* consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, shore birds, alligators, and nutria.

*Habitat for rangeland wildlife* consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include white-tailed deer, meadowlark, quail, and Attwater prairie chicken.

## engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

*Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.*

*The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.*

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and



topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

### building site development

Table 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

*Shallow excavations* are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

*Dwellings and small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, and shrink-swell potential can cause the movement of footings. A high water table, depth to bedrock, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

*Local roads and streets* have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, and depth to a high water table affect the traffic supporting capacity.

*Lawns and landscaping* require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

### sanitary facilities

Table 11 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 11 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

*Septic tank absorption fields* are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils.

Permeability, a high water table, depth to bedrock, and flooding affect absorption of the effluent. Large stones and bedrock interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

*Sewage lagoons* are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 11 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope and bedrock can cause construction problems, and large stones can hinder compaction of the lagoon floor.

*Sanitary landfills* are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 11 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock, a high water table, slope,

and flooding affect both types of landfill. Texture, stones and boulders, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

*Daily cover for landfill* is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

### construction materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good*, *fair*, or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

*Roadfill* is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place



after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

*Sand and gravel* are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 12, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

*Topsoil* is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts,

are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

### water management

Table 13 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

*Pond reservoir areas* hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

*Embankments, dikes, and levees* are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment.

Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

*Drainage* is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; and subsidence of organic layers. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

*Irrigation* is the controlled application of water to supplement rainfall and support plant growth. The design

and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

*Terraces and diversions* are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

*Grassed waterways* are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.





# soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 20.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

## engineering index properties

Table 14 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

*Depth* to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

*Texture* is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

*Classification* of the soils is determined according to the Unified soil classification system (2) and the system adopted by the American Association of State Highway and Transportation Officials (1).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 20.

*Rock fragments* larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

*Percentage (of soil particles) passing designated sieves* is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.



*Liquid limit and plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

## physical and chemical properties

Table 15 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

*Clay* as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

*Permeability* refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

*Available water capacity* refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

*Soil reaction* is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops

and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

*Salinity* is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

*Shrink-swell potential* is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

*Erosion factor K* indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

*Erosion factor T* is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

*Organic matter* is the plant and animal residue in the soil at various stages of decomposition.

In table 15, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

## soil and water features

Table 16 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

*Hydrologic soil groups* are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

*Flooding*, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 16 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that

it is likely under normal conditions; *occasional* that it occurs, on the average, no more than once in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

*High water table* (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 16.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

*Depth to bedrock* is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

*Risk of corrosion* pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as

soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

### physical, chemical, and mineralogical analyses of selected soils

Physical, chemical, and mineral properties of representative pedons sampled in Victoria County are given in tables 17, 18, and 19. The data are for soils sampled at carefully selected sites. The pedons are typical of the series and are described in the section "Soil series and their morphology." Soil samples were analyzed by the National Soil Survey Laboratory, Soil Conservation Service, Lincoln, Nebraska.

Most determinations, except those for grain-size analysis and bulk density, were made on soil material smaller than 2 millimeters in diameter. The methods used in obtaining the data are indicated in the list that follows. The codes in parentheses refer to published methods (15).

**Sand**—(0.05-2.0 mm fraction) weight percentages of materials less than 2 mm (3A1).

**Silt**—(0.002-0.05 mm fraction) pipette extraction, weight percentages of all materials less than 2 mm (3A1).

**Clay**—(fraction less than 0.002 mm) pipette extraction, weight percentages of materials less than 2 mm (3A1).

**Oven dry bulk density**—of less than 2 mm material, saran-coated clods (4A1b).

**Water retained**—pressure extraction, percentage of oven-dry weight of less than 2 mm material; 1/3 bar (4B1) and 15 bars (4B2).

**Extractable cations**—ammonium acetate pH 7.0, uncorrected; calcium (6N2e), magnesium (602d), sodium (6P2b), potassium (6Q2b).

**Extractable acidity**—barium chloride-triethanolamine II (6H2a).

**Cation-exchange capacity**—ammonium acetate, pH 7.0 (5A6a).

**Base saturation**—ammonium acetate, pH 7.0 (5C1).

**Organic carbon**—dichromate, ferric sulfate titration, automatic titration (6A1c).

**Reaction (pH)**—1:1 water dilution (8C1a).

**Reaction (pH)**—calcium chloride (8C1e).

**Exchangeable sodium percentage**—ammonium acetate pH 7.0 (5D2).

**Electrical conductivity**—saturation extract (8A1a).

**Sodium-adsorption ratio** (5E).

**Clay mineralogy**—X-ray diffraction (7A2).

### engineering index test data

Table 20 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are typical of the series and are described in the section "Soil series and their morphology." The soil samples were tested by the Texas State Department of Highways and Public Transportation.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are: AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T 90 (AASHTO), D 424 (ASTM); Method A—T 100 (AASHTO), D 698 (ASTM); Shrinkage—T 92 (AASHTO), D 427 (ASTM).



# classification of the soils

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The system of soil classification used by the National Cooperative Soil Survey has six categories (16). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 21, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

**ORDER.** Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Alfisol.

**SUBORDER.** Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aqualf (*Aqu*, meaning water, plus *alf*, from Alfisol).

**GREAT GROUP.** Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Albaqualfs (*Alb*, meaning a nearly white eluvial horizon near the surface, plus *aqualf*, the suborder of the Alfisols that have an aquic moisture regime).

**SUBGROUP.** Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Albaqualfs.

**FAMILY.** Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the

properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine, montmorillonitic, hyperthermic Typic Albaqualfs.

**SERIES.** The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

## soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (14). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (16). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

### Aransas series

The Aransas series consists of deep, very slowly permeable, poorly drained clayey soils on flood plains. These soils formed in saline, calcareous clayey alluvium. Slope ranges from 0 to 1 percent. The soils of the Aransas series are fine, montmorillonitic (calcareous), hyperthermic Vertic Haplaquolls.

Geographically associated with the Aransas soils are Austwell, Trinity, and Rydolph soils. Austwell soils are on

similar landforms. Trinity and Rydolph soils are in slightly higher areas.

Typical pedon of Aransas clay, frequently flooded; from the intersection of U.S. Highway 59 and U.S. Highway 77 in Victoria, 15.7 miles south on U.S. Highway 77 to Farm Road 445, 1.8 miles east on Farm Road 445, 1 mile southeast and east on a gravel road to a road intersection, 0.65 mile north, 0.5 mile northwest, 0.9 mile north on a gravel road to a road intersection, 1.5 miles east on a levee road, and 264 feet southwest in a plowed field:

- Ap—0 to 11 inches; very dark gray (10YR 3/1) clay; dark gray (10YR 4/1) dry; moderate fine granular structure; very hard, very firm, very sticky and plastic; few fine roots; moderately saline; calcareous; moderately alkaline; abrupt smooth boundary.
- A11—11 to 30 inches; very dark gray (10YR 3/1) clay; dark gray (10YR 4/1) dry; moderate medium blocky and subangular blocky structure; very hard, very firm, very sticky and plastic; few fine roots; strongly saline; calcareous; moderately alkaline; gradual wavy boundary.
- A12—30 to 42 inches; very dark gray (10YR 3/1) clay; dark gray (10YR 4/1) dry; moderate medium subangular blocky structure; very hard, very firm, very sticky and plastic; very few very fine concretions of calcium carbonate; strongly saline; calcareous; moderately alkaline; gradual wavy boundary.
- C2—42 to 60 inches; gray (10YR 5/1) clay; light gray (10YR 6/1) dry; massive; very hard, very firm, very sticky and plastic; moderately saline; calcareous; moderately alkaline.

The clayey alluvium is more than 60 inches thick. Thickness of the mollic epipedon ranges from 20 to 50 inches. When dry, these soils have cracks more than 0.4 inch wide that extend from the surface to a depth of more than 20 inches. Salinity is slight to strong throughout.

The Ap and A1 horizons are black, dark gray, or very dark gray. Some pedons have a few fine faint mottles and a few films and threads of calcium carbonate in the lower part of the A horizon.

The C horizon is dark gray or gray. Some pedons have a few fine, faint mottles and a few films and threads of calcium carbonate.

### Austwell series

The Austwell series consists of deep, very slowly permeable, poorly drained clayey soils on flood plains. These soils formed in saline, calcareous clayey alluvium. Slope ranges from 0 to 1 percent. Soils of the Austwell series are fine, montmorillonitic (calcareous), hyperthermic Typic Haplaquepts.

Geographically associated with the Austwell soils are Aransas, Trinity, and Rydolph soils. Aransas soils are on slightly lower flood plains. Trinity and Rydolph soils are in slightly higher areas.

Typical pedon of Austwell clay, frequently flooded; from the intersection of U.S. Highway 59 and U.S. Highway 77 in Victoria, 15.7 miles south on U.S. Highway 77 to Farm Road 445, 1.8 miles east on Farm Road 445, 0.55 mile southeast and 1.2 miles south on a paved road, 2.4 miles east-southeast on a gravel road, 0.4 mile east on a dirt road, and 30 feet north, in rangeland:

- A1—0 to 18 inches; dark gray (10YR 4/1) clay; gray (10YR 5/1) dry; moderate medium and coarse subangular blocky structure; very hard, very firm, very sticky and plastic; many fine roots; moderately saline; calcareous; moderately alkaline; gradual wavy boundary.
- B21g—18 to 35 inches; dark gray (10YR 4/1) clay; gray (10YR 5/1) dry; few fine faint yellowish brown mottles; moderate medium subangular blocky structure; very hard, very firm, very sticky and plastic; few fine roots; moderately saline; calcareous; moderately alkaline; gradual wavy boundary.
- B22g—35 to 42 inches; grayish brown (10YR 5/2) clay; light brownish gray (10YR 6/2) dry; common fine distinct yellowish brown mottles; moderate medium subangular blocky structure; very hard, very firm, very sticky and plastic; moderately saline; calcareous; moderately alkaline; gradual wavy boundary.
- C1g—42 to 52 inches; light brownish gray (10YR 6/2) silty clay loam; light gray (10YR 7/2) dry; common fine distinct yellowish brown mottles; massive; very hard, very firm; moderately saline; calcareous; moderately alkaline; abrupt wavy boundary.
- C2g—52 to 60 inches; light gray (10YR 6/1) silty clay loam; light gray (10YR 7/1) dry; common fine distinct yellowish brown mottles; massive; very hard, firm; moderately saline; calcareous; moderately alkaline.

The clayey alluvium is more than 60 inches thick. In most years these soils are saturated for long periods and are seldom dry below 12 inches. A water table is within 24 inches of the surface during wet seasons. The electrical conductivity of the saturation extract ranges from 2 to 7 millimhos per centimeter in the A horizon and from 4 to 9 millimhos per centimeter in the B horizon.

The A horizon is dark gray. It has a few brownish mottles in some pedons.

The B2g horizon is dark gray, gray, or grayish brown. Reddish or brownish mottles range from few to common in most pedons.

The Cg horizon is light brownish gray or light gray. In some pedons, reddish or brownish mottles range from

few to common. A IIC horizon occurs in some pedons below a depth of about 50 inches.

## Cieno series

The Cieno series consists of deep, very slowly permeable, poorly drained loamy soils. These soils formed in clayey and loamy sediments. Slope ranges from 0 to 1 percent. The soils of the Cieno series are fine-loamy, siliceous, hyperthermic Typic Ochraqualfs.

Geographically associated with the Cieno soils are Nada, Telferner, and Fordtran soils, which are on slightly higher landforms than Cieno soils.

Typical pedon of Cieno sandy clay loam in an area of Nada-Cieno complex, 0 to 1 percent slopes (fig. 9); from the intersection of U.S. Highway 59 and U.S. Highway 77 in Victoria, 2.9 miles north on U.S. Highway 77 to Farm Road 1315, 11.8 miles northeast on Farm Road 1315, and 450 feet southeast in rangeland:

- A1—0 to 6 inches; dark gray (10YR 4/1) sandy clay loam; gray (10YR 5/1) dry; moderate medium subangular blocky structure; very hard, firm, slightly sticky; common fine roots; few crayfish krotovinas 1 to 3 centimeters in diameter; medium acid; diffuse boundary.
- B21tg—6 to 16 inches; dark gray (10YR 4/1) clay loam; gray (10YR 5/1) dry; moderate medium subangular blocky structure; extremely hard, very firm, very sticky and plastic; common fine roots; few crayfish krotovinas 1 to 3 centimeters in diameter; medium acid; diffuse boundary.
- B22tg—16 to 28 inches; dark gray (10YR 4/1) clay loam; gray (10YR 5/1) dry; moderate medium blocky structure; extremely hard, very firm, very sticky and plastic; common fine roots; few crayfish krotovinas 1 to 4 centimeters in diameter; medium acid; diffuse boundary.
- B23tg—28 to 40 inches; gray (10YR 5/1) sandy clay loam; grayish brown (10YR 5/2) dry; few fine distinct yellowish brown mottles; moderate medium blocky structure; extremely hard, very firm, very sticky and plastic; few fine roots; few fine dark concretions; uncoated sand on surfaces of some peds; few crayfish krotovinas 1 to 4 centimeters in diameter; neutral; gradual boundary.
- B24tg—40 to 51 inches; grayish brown (10YR 5/2) sandy clay loam; light brownish gray (10YR 6/2) dry; few fine distinct brownish yellow mottles; weak medium prismatic structure parting to weak medium blocky; extremely hard, very firm, sticky; few fine roots; few fine dark concretions; uncoated sand on surfaces of some peds; few crayfish krotovinas 2 to 5 centimeters in diameter; calcareous; mildly alkaline; clear smooth boundary.
- B31g—51 to 62 inches; grayish brown (10YR 5/2) sandy clay loam; light brownish gray (10YR 6/2) dry; few fine distinct brownish yellow mottles; weak fine

prismatic structure parting to weak medium blocky; extremely hard, very firm, slightly sticky; few fine roots; few fine threads and concretions of calcium carbonate; few fine dark concretions; uncoated sand on surfaces of some peds; few crayfish krotovinas 2 to 6 centimeters in diameter; calcareous; moderately alkaline; diffuse boundary.

B32g—62 to 77 inches; grayish brown (10YR 5/2) sandy clay loam; light brownish gray (10YR 6/2) dry; few fine distinct brownish yellow mottles; weak medium prismatic structure parting to weak coarse blocky; extremely hard, very firm, slightly sticky; few fine roots; few fine and medium threads and concretions of calcium carbonate; few fine dark concretions; uncoated sand on faces of some peds; medium and coarse black stains on faces of some peds; calcareous; moderately alkaline; diffuse boundary.

B33g—77 to 80 inches; light brownish gray (2.5Y 6/2) sandy clay loam; light gray (2.5Y 7/2) dry; weak medium prismatic structure parting to weak coarse blocky; extremely hard, very firm, slightly sticky; few fine roots along surface of prisms; common fine and medium threads and concretions of calcium carbonate; few fine dark concretions; coarse black stains on faces of some peds; calcareous; moderately alkaline.

Solum thickness is more than 80 inches. The coefficient of linear extensibility value in the upper 20 inches of the B2tg horizon is 0.02 to 0.08. Depth to free carbonates is 30 to about 50 inches. Few to common crayfish krotovinas, which are mainly in the upper 60 inches, are mostly 1 to 6 centimeters in diameter and commonly contain less clay than the B2tg horizon. Uncoated sand grains are on the surface of some peds. Interfingers of uncoated sand 2 to 4 centimeters long and about 1 centimeter wide range from none to a few throughout the B2tg horizon and make up less than 5 percent of the matrix. Fine to medium, dark concretions range from none to a few throughout.

The A horizon is dark gray or dark grayish brown. It has none to few brownish or yellowish mottles. It is medium acid to neutral.

The B2tg horizon is dark gray, gray, light gray, dark grayish brown, grayish brown, or light brownish gray. The B2tg horizon has none to common fine and medium, distinct mottles of brown or yellow. Texture is sandy clay loam, sandy clay, or clay loam. The weighted average clay content of the control section is 27 to 35 percent. Reaction is medium acid to neutral in the B21tg horizon and slightly acid to moderately alkaline in the lower part of the B2tg horizon.

The B3g horizon is gray, light gray, grayish brown, or light brownish gray sandy clay loam or clay loam. It has few to common fine, distinct mottles of yellow or brown and few to common fine and medium threads, soft



masses, and concretions of calcium carbonate. Reaction is mildly alkaline or moderately alkaline.

### Contee series

The Contee series consists of deep, very slowly permeable, somewhat poorly drained loamy soils on uplands. These soils formed in calcareous clayey sediments. Slope ranges from 0 to 1 percent. The soils of the Contee series are fine, montmorillonitic (calcareous), hyperthermic Vertic Haplaquepts.

Geographically associated with the Contee soils are Lake Charles, Edna, Dacosta, and Telferner soils. Lake

Charles and Edna soils are in similar positions, or they are in slightly higher areas. Telferner soils are in slightly higher areas. Dacosta soils are in microdepressions adjacent to Contee soils.

Typical pedon of Contee clay loam in an area of Dacosta-Contee complex, 0 to 1 percent slopes; from the intersection of Loop 175 and U.S. Highway 77 south of Victoria, 3.5 miles south on U.S. Highway 77 to Kemper City Road Number 1, 0.7 mile southwest on Kemper City Road Number 1, and 530 feet northwest, on a microknoll in rangeland:

A1—0 to 9 inches; very dark gray (10YR 3/1) clay loam; dark gray (10YR 4/1) dry; massive; extremely hard,



Figure 9.—Profile of Cieno sandy clay loam. Uncoated sand covers the surface of some pedons below a depth of 28 inches.

firm, sticky and slightly plastic; few fine roots; calcareous; moderately alkaline; clear smooth boundary.

B21—9 to 15 inches; dark gray (10YR 4/1) clay; gray (10YR 5/1) dry; weak medium subangular blocky structure; extremely hard, very firm, sticky and plastic; few fine roots; few fine dark concretions; few fine pitted concretions of calcium carbonate; calcareous; moderately alkaline; gradual wavy boundary.

B22—15 to 56 inches; light brownish gray (10YR 6/2) clay; light gray (10YR 7/2) dry; weak medium subangular blocky structure; extremely hard, very firm, sticky and plastic; few fine roots; few fine dark concretions; few medium masses of calcium carbonate parting to fine pitted concretions and fine smooth concretions; calcareous; moderately alkaline; gradual wavy boundary.

C—56 to 80 inches; light yellowish brown (10YR 6/4) clay; very pale brown (10YR 7/4) dry; few fine faint yellowish mottles; massive; extremely hard, very firm; few fine dark concretions; few medium masses of calcium carbonate parting to fine pitted concretions and fine smooth concretions and soft masses; calcareous; moderately alkaline.

Solum thickness ranges from 42 to 60 inches. In most years these soils are saturated during winter and spring. During dry periods they have cracks more than 0.4 inch wide that extend from the surface to a depth of more than 20 inches. The B and C horizons range from nonsaline to moderately saline.

The A horizon is very dark gray, dark gray, or dark grayish brown.

The B2 horizon is dark gray, gray, dark grayish brown, or light brownish gray clay or silty clay. It has none to common fine, distinct mottles of yellow or brown in the lower part. A few fine dark concretions occur in most pedons. Fine and medium, soft masses and concretions of calcium carbonate range from few to common.

The C horizon is grayish brown, light brownish gray, light olive gray, or light yellowish brown clay or silty clay. It has none to few, fine, faint mottles of yellow or brown. A few fine, dark concretions occur in some pedons. Fine and medium, soft masses and concretions of calcium carbonate range from few to common.

## Dacosta series

The Dacosta series consists of deep, very slowly permeable, somewhat poorly drained loamy soils on uplands. These soils formed in calcareous clayey sediments. Slope ranges from 0 to 5 percent. The soils of the Dacosta series are fine, montmorillonitic, hyperthermic Vertic Ochraqualfs.

Geographically associated with the Dacosta soils are Lake Charles, Edna, Contee, and Telferner soils. Lake Charles, Telferner, and Edna soils are on similar or

higher positions. Contee soils, which occur in complex with Dacosta soils, are on microknolls.

Typical pedon of Dacosta sandy clay loam, 0 to 1 percent slopes (fig. 10); from the intersection of Farm Road 616 and U.S. Highway 87 in Placedo, 1.85 miles southeast on U.S. Highway 87, 1.1 miles northeast on gravel road to a drainage ditch, 0.15 mile southeast along drainage ditch, and 686 feet south-southwest in pasture:

A1—0 to 6 inches; very dark gray (10YR 3/1) sandy clay loam; dark gray (10YR 4/1) dry; massive; very hard, firm, sticky and slightly plastic; many fine and very fine roots; few fine pores; neutral; clear smooth boundary.

B1g—6 to 12 inches; very dark gray (10YR 3/1) sandy clay loam; dark gray (10YR 4/1) dry; weak fine and medium subangular blocky structure; very hard, very firm, sticky and plastic; common fine and very fine roots; few fine pores; few fine dark concretions; neutral; clear smooth boundary.

B21tg—12 to 21 inches; dark gray (10YR 4/1) sandy clay; gray (10YR 5/1) dry; weak medium blocky structure; very hard, very firm, sticky and plastic; common fine and few medium roots; few pressure faces; few thin gray clay films on faces of peds; few fine dark concretions; neutral; clear wavy boundary.

B22tg—21 to 29 inches; dark gray (10YR 4/1) clay; gray (10YR 5/1) dry; weak medium blocky structure; very hard, very firm, sticky and plastic; few fine, very fine, and medium roots; few pressure faces; few thin gray clay films on faces of peds; few fine dark concretions; neutral; clear wavy boundary.

B23tg—29 to 40 inches; dark gray (10YR 4/1) clay; gray (10YR 5/1) dry; weak fine and medium subangular blocky structure; very hard, very firm, sticky and plastic; few fine and very fine roots; few pressure faces; few thin gray clay films on faces of peds; few fine dark concretions; few fine pitted concretions of calcium carbonate; slightly saline; mildly alkaline; gradual wavy boundary.

B31g—40 to 52 inches; light brownish gray (2.5Y 6/2) sandy clay; light gray (2.5Y 7/2) dry; weak fine and medium subangular blocky structure; very hard, very firm; few fine and very fine roots; few thin gray clay films on faces of peds; few fine dark concretions; few fine pitted concretions of calcium carbonate; calcareous; moderately saline; mildly alkaline; gradual wavy boundary.

B32g—52 to 78 inches; light brownish gray (10YR 6/2) sandy clay loam; light gray (10YR 7/2) dry; common medium and coarse prominent yellowish red (5YR 5/8), vertically oriented mottles; weak fine and medium blocky structure; very hard, very firm; few fine and very fine roots; few thin light brownish gray clay films on faces of peds; few fine dark concretions; few coarse masses of calcium



carbonate parting to hard fine pitted concretions and few hard to very hard calcium carbonate fragments that are 2 to 10 centimeters across and 0.5 to 1 centimeter thick; slightly saline; mildly alkaline; gradual wavy boundary.

C—78 to 80 inches; very pale brown (10YR 7/4) sandy clay loam; very pale brown (10YR 8/4) dry; few fine faint mottles in contrasting shades of yellow and gray; massive; very hard, very firm; few fine roots; few fine dark concretions; slightly saline; neutral.

Solum thickness ranges from 60 to more than 80 inches. In most years these soils are saturated during winter and spring. During dry periods they have cracks more than 0.4 inch wide that extend from the surface to a depth of more than 20 inches. The coefficient of linear extensibility value in the upper part of the Btg horizon ranges from 0.09 to 0.13. Concretions of calcium carbonate range from none to a few below a depth of 12 inches, and soft masses, films, or threads range from none to a few below a depth of 40 inches. Fine and medium, dark concretions range from none to a few throughout. Salinity in the B and C horizons ranges from none to moderate.

The A horizon is very dark gray or black sandy clay loam or clay loam. This horizon is massive and extremely hard or very hard when dry. Some pedons have a few brownish mottles. Reaction is slightly acid or neutral.

The B1g horizon is very dark gray, dark gray, or black. Texture is clay loam, sandy clay loam, or sandy clay. Some pedons have a few brownish mottles. Reaction is slightly acid to mildly alkaline.

The B2tg horizon is very dark gray, dark gray, gray, or black. This horizon is clay, sandy clay, or clay loam that is 35 to 55 percent clay. The B2tg horizon has none to few fine, faint mottles of yellow or brown. It is slightly acid to moderately alkaline.

The B3g horizon is gray, light gray, light brownish gray, pale brown, or light yellowish brown clay, clay loam, sandy clay, or sandy clay loam. It contains common distinct or prominent mottles in contrasting shades of red, brown, yellow, and gray.

The C horizon is very pale brown or white sandy clay loam, sandy clay, or clay loam. It has none to few fine mottles in contrasting shades of yellow and gray. Reaction is neutral to moderately alkaline.

## Degola series

The Degola series consists of deep, moderately permeable, well drained loamy soils on flood plains. These soils formed in calcareous loamy alluvium. Slope ranges from 0 to 1 percent. The soils of the Degola series are fine-loamy, mixed, hyperthermic Cumulic Haplustolls.

Geographically associated with the Degola soils are the Sinton soils. Sinton soils are on similar landforms.

Typical pedon of Degola sandy clay loam, frequently flooded; from the intersection of U.S. Highway 77 and U.S. Highway 59 in Victoria; 11.3 miles north on U.S. Highway 77 to a ranch road, 0.6 mile southeast on ranch road, and 100 feet south in pasture:

A11—0 to 20 inches; very dark gray (10YR 3/1) sandy clay loam; dark gray (10YR 4/1) dry; weak fine

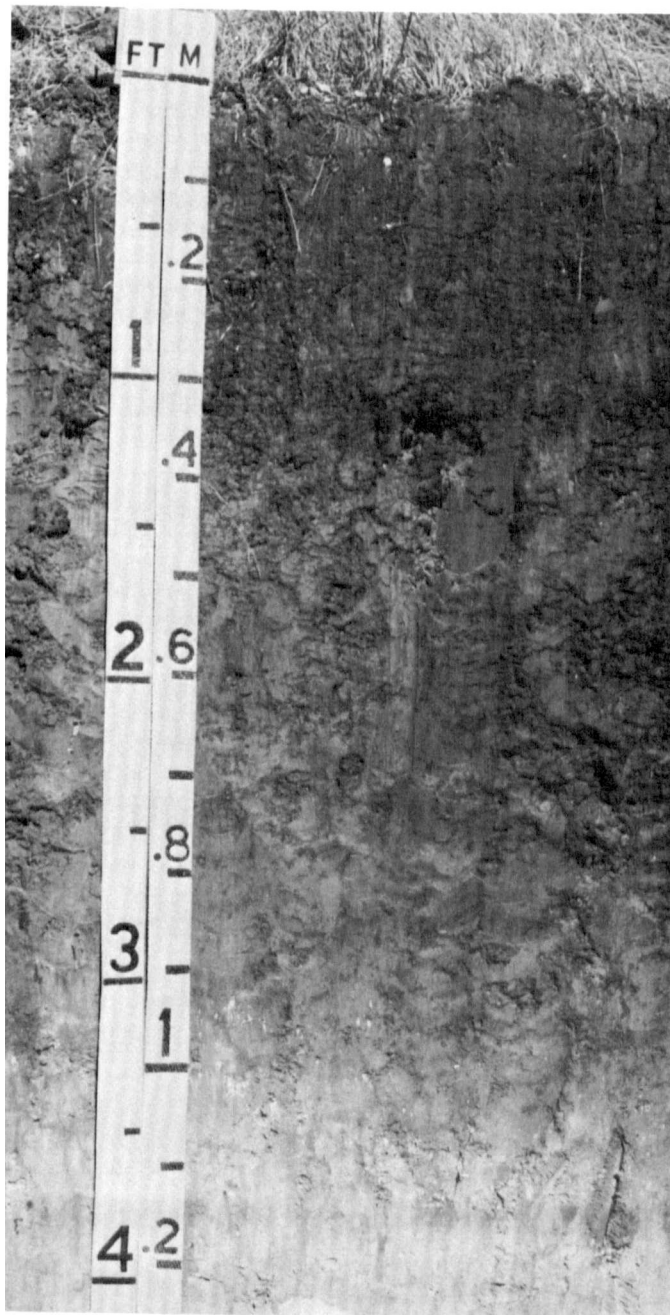


Figure 10.—Profile of Dacosta sandy clay loam, 0 to 1 percent slopes. The surface layer of this soil is very hard and massive when dry.



granular and weak medium subangular blocky structure; slightly hard, friable, sticky and plastic; common fine and few very fine roots; few fine pores; slightly acid; clear smooth boundary.

A12—20 to 25 inches; very dark grayish brown (10YR 3/2) sandy clay loam; dark grayish brown (10YR 4/2) dry; weak fine and medium subangular blocky structure; hard, firm, sticky and plastic; few fine and medium concretions of soft masses of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

Cca—25 to 60 inches; light brownish gray (10YR 6/2) sandy clay loam; light gray (10YR 7/2) dry; massive; hard, friable, sticky and slightly plastic; few streaks of slightly darker material; few medium dark soft masses and concretions; common fine and medium soft masses and concretions of calcium carbonate; calcareous; moderately alkaline.

The loamy alluvium is more than 60 inches thick. The 10- to 40-inch control section is 20 to 35 percent clay and is more than 15 percent fine sand.

The A horizon is black, very dark gray, or very dark grayish brown. It ranges from 20 to 30 inches in thickness. Reaction is slightly acid or neutral but ranges to moderately alkaline in the A12 horizon.

The Cca horizon is dark gray, gray, or light brownish gray sandy clay loam or clay loam. A few pedons have few to common fine or medium, dark masses or concretions. Fine and medium concretions and soft masses of calcium carbonate range from common to many.

The Degola soils in this survey area are taxadjuncts to the Degola series in that the lower part of the mollic epipedon is more alkaline and the C horizon contains more calcium carbonate than is typical for the Degola series. These differences, however, do not affect the use and management of the soils.

## Denhawken series

The Denhawken series consists of deep, very slowly permeable, well drained soils on uplands. These soils formed in calcareous clayey sediments. Slope ranges from 0 to 2 percent. The soils of the Denhawken series are fine, montmorillonitic, hyperthermic Vertic Ustochrepts.

Geographically associated with the Denhawken soils are Elmendorf, Weesatche, Sarnosa, and Papalote soils. Weesatche, Sarnosa, and Papalote soils occur in similar areas. Elmendorf soils, which occur in complex with Denhawken soils, are in microdepressions.

Typical pedon of Denhawken clay in an area of Denhawken-Elmendorf complex, 0 to 1 percent slopes; from the intersection of Farm Road 236 and Farm Road 237 north of Mission Valley, 5.0 miles westward on Farm Road 237 to the intersection of Farm Road 237 and Moritz Road, 0.5 mile southwest on Moritz Road to a

private road, 0.1 mile southeast on a private road, and 150 feet south-southeast in a pasture, on a microknoll:

A1—0 to 5 inches; very dark grayish brown (10YR 3/2) clay loam; grayish brown (10YR 5/2) dry; weak fine granular structure; hard, firm, sticky and plastic; common very fine and fine roots; few fine pores; few fine concretions of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

B21ca—5 to 27 inches; grayish brown (10YR 5/2) clay; light brownish gray (10YR 6/2) dry; weak and moderate fine subangular blocky structure; very hard, firm, sticky and very plastic; few very fine and fine roots; few fine pores; common fine concretions of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

B22ca—27 to 53 inches; grayish brown (10YR 5/2) clay; light brownish gray (10YR 6/2) dry; weak fine angular blocky structure; very hard, firm, sticky and very plastic; few pressure faces; common fine concretions and few soft masses of calcium carbonate; calcareous; moderately alkaline; clear wavy boundary.

Cca—53 to 73 inches; reddish yellow (7.5YR 6/6) clay; reddish yellow (7.5YR 7/6) dry; massive; hard, very firm, sticky and plastic; common fine and medium concretions and soft masses of calcium carbonate; calcareous; moderately alkaline.

Solum thickness ranges from 40 to 60 inches. When dry, these soils have cracks more than 0.4 inch wide that extend from the surface to a depth of more than 20 inches.

The A horizon is very dark grayish brown or dark grayish brown. A few fine concretions of calcium carbonate occur in most pedons.

The B2 horizon is dark grayish brown, grayish brown, light brownish gray, or pale brown. Some pedons have few to common fine distinct mottles in the lower part. This horizon is clay or clay loam that is 35 to 55 percent clay. Fine and medium concretions and soft masses of calcium carbonate range from few to common.

The Cca horizon is reddish yellow or brown. In some pedons, it has few to common fine and medium, faint and distinct, light brownish gray mottles. Fine and medium concretions and soft masses of calcium carbonate range from few to common.

## Edna series

The Edna series consists of deep, very slowly permeable, poorly drained loamy soils on uplands. These soils formed in clayey and loamy sediments. Slope ranges from 0 to 3 percent. The soils of the Edna series are fine, montmorillonitic, thermic Vertic Albaqualfs.

Geographically associated with the Edna soils are Dacosta, Lake Charles, and Telferner soils. Dacosta

soils are on similar landforms. Lake Charles and Telferner soils are in slightly higher areas.

Typical pedon of Edna fine sandy loam, 0 to 1 percent slopes; from the intersection of U.S. Highway 87 and Loop 175 in Victoria, 6.9 miles southeast on U.S. Highway 87 to Farm Road 1686 in the town of Dacosta, 1.7 miles northeast on Farm Road 1686 to Farm Road 3085, 1.65 miles southeast on Farm Road 3085, 0.05 mile northeast on Pickering Road No. 2, and 20 feet northwest in pasture:

- Ap—0 to 8 inches; dark grayish brown (10YR 4/2) fine sandy loam; grayish brown (10YR 5/2) dry; massive; very hard, friable; many fine roots and few medium roots; slightly acid; abrupt wavy boundary.
- B21tg—8 to 18 inches; dark gray (10YR 4/1) clay; gray (10YR 5/1) dry; few fine prominent red (2.5YR 4/6) and common fine and medium distinct brownish yellow (10YR 6/8) mottles; moderate fine subangular blocky structure; extremely hard, firm, sticky and plastic; thin clay films on faces of peds; many fine roots; slightly acid; clear wavy boundary.
- B22tg—18 to 41 inches; gray (10YR 6/1) clay loam; light gray (10YR 7/1) dry; common medium prominent reddish yellow (7.5YR 6/8) and common fine and medium prominent strong brown (7.5YR 5/6) mottles; strong fine angular blocky structure; extremely hard, firm, sticky and plastic; few fine roots; patchy clay films on faces of peds; organic stains along root channels; few fine dark concretions; neutral; clear wavy boundary.
- B31g—41 to 61 inches; grayish brown (10YR 5/2) clay loam; light brownish gray (10YR 6/2) dry; common medium distinct yellowish red (5YR 5/6) and common fine distinct dark gray (10YR 4/1) mottles; weak medium subangular blocky structure; extremely hard, firm, sticky and plastic; few fine roots; few clay films on faces of peds; few fine dark concretions; few fine soft masses of calcium carbonate; calcareous; moderately alkaline; gradual wavy boundary.
- B32g—61 to 80 inches; light gray (10YR 7/1) clay loam; light gray (10YR 7/1) dry; common medium distinct yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; very hard, firm, sticky and plastic; few coarse soft masses of calcium carbonate; calcareous; moderately alkaline.

Solum thickness ranges from 60 to more than 80 inches. The coefficient of linear extensibility in the upper 20 inches of the B2t horizon ranges from 0.04 to 0.11. Most pedons have few to common fine to medium concretions of calcium carbonate below a depth of 35 inches. Fine dark concretions range from none to a few throughout. When dry, these soils have cracks 1 centimeter or more wide in the upper part of the subsoil.

The thickness of the A horizon is more than 4 inches and less than 10 inches in more than 50 percent of any

pedon but ranges to 20 inches. The A horizon is very dark grayish brown or dark grayish brown. Some pedons have a thin, discontinuous A2g horizon of higher value than the Ap or A1 horizon where the A horizon is the thickest. Reaction is medium acid to neutral.

The B2tg horizon is dark gray, dark grayish brown, grayish brown, or gray. This horizon is clay or clay loam that is 35 to 50 percent clay. The B2tg horizon has common fine and medium mottles in contrasting shades of brown, yellow, and red. Coatings of darker colors are on the faces of peds in some pedons. Reaction is medium acid to neutral.

The B3g horizon is dark gray, gray, light gray, light brownish gray, grayish brown, brown, pale brown, very pale brown, light yellowish brown, or pale yellow. The B3g horizon has few to common fine or medium mottles in contrasting shades of red, gray, brown, or yellow. Texture is clay loam or sandy clay loam.

## Elmendorf series

The Elmendorf series consists of deep, very slowly permeable, well drained soils on uplands. These soils formed in calcareous clayey sediments. Slope ranges from 0 to 2 percent. The soils of the Elmendorf series are fine, montmorillonitic, hyperthermic Vertic Argiustolls.

Geographically associated with the Elmendorf soils are Denhawken, Weesatche, Sarnosa, and Papalote soils. Weesatche, Sarnosa, and Papalote soils occur on similar landforms. Denhawken soils, which occur in complex with Elmendorf soils, are on microknolls.

Typical pedon of Elmendorf clay loam in an area of Denhawken-Elmendorf complex, 0 to 2 percent slopes; from the intersection of Farm Road 236 and Farm Road 237 north of Mission Valley, 5.0 miles westward on Farm Road 237 to the intersection of Farm Road 237 and Moritz Road, 0.5 mile southwest on Moritz Road to a private road, 0.1 mile southeast on a private road, and 150 feet south-southeast in a pasture, in a microdepression:

- A1—0 to 11 inches; black (10YR 2/1) clay loam; very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; hard, firm, sticky and plastic; common fine roots; few fine pores; neutral; clear smooth boundary.
- B21t—11 to 19 inches; black (10YR 2/1) clay; very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; very hard, very firm, sticky and plastic; few fine roots; few fine pores; neutral; clear smooth boundary.
- B22t—19 to 33 inches; black (10YR 2/1) clay; very dark gray (10YR 3/1) dry; weak moderate blocky structure; extremely hard, extremely firm, sticky and plastic; moderately alkaline; clear wavy boundary.
- B23t—33 to 49 inches; dark gray (10YR 4/1) clay; gray (10YR 5/1) dry; weak medium blocky structure; extremely hard, extremely firm, sticky and plastic;



evident pressure faces; calcareous; moderately alkaline; clear wavy boundary.

B3ca—49 to 60 inches; light brownish gray (10YR 6/2) clay; light gray (10YR 7/2) dry; massive; extremely hard, extremely firm, sticky and plastic; few fine concretions of calcium carbonate; calcareous; moderately alkaline; clear wavy boundary.

Cca—60 to 80 inches; yellowish red (5YR 5/6) clay; reddish yellow (5YR 6/6) dry; common medium prominent light yellowish brown (10YR 6/4) mottles; massive; extremely hard, extremely firm, sticky and plastic; common fine and medium concretions and soft masses of calcium carbonate.

Solum thickness ranges from 60 to more than 80 inches. When dry, these soils have cracks more than 0.4 inch wide that extend from the surface to a depth of more than 20 inches.

The A horizon is black or very dark gray. Thickness of the A horizon ranges from 10 to 20 inches. Reaction is neutral or mildly alkaline.

The B2t horizon is black, very dark gray, or dark gray. This horizon is clay that is 40 to 50 percent clay. Reaction is neutral to moderately alkaline.

The B3ca and Cca horizons are grayish, yellowish, or brownish and are mottled in places in shades of gray, yellow, or brown. These horizons are clay or clay loam. Fine and medium concretions and soft masses of calcium carbonate range from few to common. Reaction is mildly alkaline or moderately alkaline.

## Faddin series

The Faddin series consists of deep, very slowly permeable, somewhat poorly drained loamy soils on uplands. These soils formed in calcareous clayey and loamy sediments. Slope ranges from 0 to 5 percent. The soils of the Faddin series are fine, montmorillonitic, hyperthermic Abruptic Argiaquolls.

Geographically associated with the Faddin soils are Edna, Dacosta, and Fordtran soils that are on slightly lower landforms.

Typical pedon of Faddin fine sandy loam, 0 to 1 percent slopes (fig. 11); from the intersection of Loop 175 and U.S. Highway 77 southwest of Victoria, 11.3 miles south on U.S. Highway 77 to Farm Road 445, 1.9 miles east on Farm Road 445, 1.0 mile northeast and north, 0.45 mile east, and 50 feet north in rangeland:

A1—0 to 16 inches; very dark grayish brown (10YR 3/2) fine sandy loam; grayish brown (10YR 5/2) dry; moderate fine and very fine subangular blocky structure; slightly hard, very friable; many fine and very fine roots and few medium roots; common very fine pores; slightly acid; abrupt wavy boundary.

B21tg—16 to 24 inches; very dark gray (10YR 3/1) clay; gray (10YR 5/1) dry; common medium and coarse prominent red (2.5YR 4/6) and few fine and medium

distinct strong brown (7.5YR 5/8) mottles; moderate fine blocky structure; extremely hard, very firm, sticky and plastic; common fine and very fine and few medium roots; few very fine pores; few small slickensides and pressure faces; thin patchy clay films on faces of peds; neutral; abrupt boundary.

B22tg—24 to 35 inches; gray (10YR 6/1) clay; light gray (10YR 7/1) dry; common medium and coarse distinct yellowish brown (10YR 5/6) mottles; moderate fine blocky structure; extremely hard, very firm, sticky and plastic; common fine and very fine roots; few small slickensides and pressure faces; thin patchy clay films on faces of peds; neutral; clear wavy boundary.

B23tg—35 to 46 inches; grayish brown (10YR 5/2) sandy clay; light brownish gray (10YR 6/2) dry; moderate medium prismatic structure parting to moderate medium and coarse blocky; extremely hard, very firm, sticky and plastic; few fine roots; clay films along faces of prisms and patchy clay films on faces of some peds; few fine dark concretions; few fine pitted concretions of calcium carbonate; calcareous; moderately alkaline; gradual wavy boundary.

B3ca—46 to 80 inches; light yellowish brown (2.5Y 6/4) clay loam; pale yellow (2.5Y 7/4) dry; weak medium and coarse blocky structure parting to weak fine and very fine subangular blocky; extremely hard, firm, sticky and plastic; few fine roots; thin patchy clay films on faces of peds; few fine dark concretions; about 30 percent by volume soft powdery masses of calcium carbonate 0.4 to 1 centimeter in diameter; few hard pitted concretions 2.5 to 8 centimeters in diameter; calcareous; moderately alkaline.

Solum thickness ranges from 60 to more than 80 inches. The mollic epipedon ranges from 16 to 30 inches in thickness. It commonly includes all of the A horizon and the upper part of the B2t horizon. The depth to secondary calcium carbonate ranges from 28 to 40 inches. Most pedons have a few dark concretions.

The A horizon is black, very dark brown, very dark grayish brown, or very dark gray. Texture is fine sandy loam and very fine sandy loam. Thickness of the A horizon ranges from 8 to 14 inches on subsoil crests and from 14 to 20 inches in subsoil troughs. Some pedons have a discontinuous A2g horizon 1 to 3 inches thick in subsoil troughs. The boundary of the A and B2t horizons is abrupt on subsoil crests, but is clear in most pedons in the lowest part of subsoil troughs. This horizon is slightly acid to neutral.

The B2tg horizon is black, very dark gray, dark gray, very dark grayish brown, light brownish gray, grayish brown, or light gray. This horizon is clay, sandy clay, or clay loam that is 35 to 55 percent clay. The B2tg horizon has common to many, fine, medium, and coarse mottles in contrasting shades of gray, brown, yellow, or red. A

few fine, dark concretions are in some pedons. Reaction ranges from slightly acid to neutral in the B21tg and B22tg horizons and from mildly alkaline to moderately alkaline in the lower part of the B2tg horizon.

The B3ca horizon is dark grayish brown, light brownish gray, pale brown, light yellowish brown, grayish brown, or very pale brown. Texture is sandy clay loam, clay loam, or sandy clay. This horizon has common fine to coarse, soft masses and concretions of calcium carbonate. It is mildly alkaline to moderately alkaline.

### Fordtran series

The Fordtran series consists of deep, very slowly permeable, somewhat poorly drained sandy soils on uplands. These soils formed in sandy and loamy sediments. Slope ranges from 0 to 3 percent. Soils of the Fordtran series are clayey, mixed, hyperthermic Arenic Albaqualfs.

Geographically associated with the Fordtran soils are Garcitas, Kuy, and Telferner soils. Garcitas and Kuy soils are on rounded, low hills and side slopes. Telferner soils are on similar landforms.

Typical pedon of Fordtran loamy fine sand, 0 to 3 percent slopes; from the intersection of U.S. Highway 59 and U.S. Highway 77 in Victoria, 17 miles north on U.S. Highway 77, 4.3 miles southwest on Nursery Road, and 0.4 mile north in pasture:

- A1—0 to 28 inches; dark grayish brown (10YR 4/2) loamy fine sand; grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; slightly hard, very friable; many fine roots; slightly acid; clear wavy boundary.
- A2—28 to 37 inches; grayish brown (10YR 5/2) loamy fine sand; light gray (10YR 7/2) dry; weak fine subangular blocky structure; slightly hard, very friable; many fine roots; slightly acid; abrupt wavy boundary.
- B21tg—37 to 55 inches; light gray (10YR 7/2) clay; white (10YR 8/2) dry; many coarse prominent dusky red (2.5YR 3/2) mottles; moderate medium blocky structure; extremely hard, very firm, very sticky and plastic; few fine roots; medium acid; diffuse wavy boundary.
- B22tg—55 to 70 inches; light brownish gray (10YR 6/2) sandy clay; light gray (10YR 7/2) dry; many medium prominent dusky red (2.5YR 3/2) mottles; moderate medium blocky structure; extremely hard, very firm, very sticky and plastic; few fine roots; medium acid.

Solum thickness ranges from 50 to more than 80 inches.

The A horizon ranges from 20 to 40 inches in thickness. The A1 horizon is dark grayish brown or brown. The A2 horizon is light brownish gray, grayish brown, or light gray. It is medium acid to slightly acid.

The B2tg horizon is dark gray, gray, light gray, dark grayish brown, light brownish gray, or grayish brown. This horizon is clay loam, sandy clay loam, or clay that is 35 to 50 percent clay. The B2tg horizon has common to many medium and coarse mottles in contrasting shades of gray, brown, or yellow. It is medium acid to slightly acid.

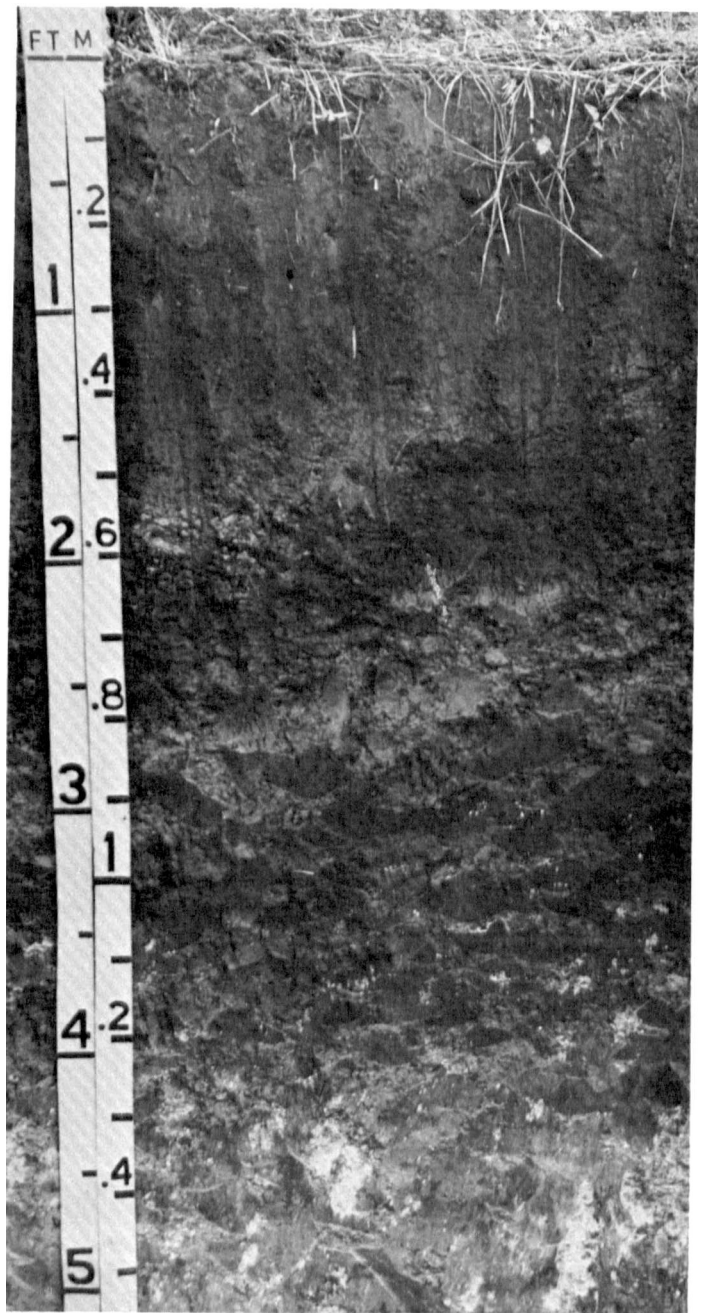


Figure 11.—Profile of Faddin fine sandy loam, 0 to 1 percent slopes. The very friable surface layer rests abruptly on the very firm clayey subsoil.



The B3 horizon, if present, is light gray or reddish yellow. Texture is fine sandy loam, sandy clay loam, or clay loam. Reaction is neutral to moderately alkaline.

### Garcitas series

The Garcitas series consists of deep, very slowly permeable, somewhat poorly drained gravelly soils on uplands. These soils formed in interbedded clayey, loamy, and gravelly deposits. Slope ranges from 1 to 5 percent. Soils of the Garcitas series are clayey, mixed, hyperthermic Aquic Arenic Paleustalfs.

Geographically associated with the Garcitas soils are the Fordtran and Telferner soils. Fordtran soils are on similar landforms. Telferner soils are in slightly lower areas.

Typical pedon of Garcitas gravelly loamy fine sand, 1 to 5 percent slopes; from the intersection of U.S. Highway 77 and U.S. Highway 59 in Victoria, 16.3 miles north on U.S. Highway 77, and 115 feet west in rangeland:

- A11—0 to 5 inches; brown (7.5YR 4/4) gravelly loamy fine sand; brown (7.5YR 5/4) dry; weak and moderate fine granular structure; slightly hard and very friable; few fine roots; few fine pores; about 15 percent by volume of rounded siliceous pebbles; medium acid; clear smooth boundary.
- A12—5 to 21 inches; brown (7.5YR 4/4) very gravelly fine sand; light brown (7.5YR 6/4) dry; single grained; loose; few fine roots; few fine pores; about 60 percent by volume of rounded siliceous pebbles; medium acid; clear wavy boundary.
- B21tg—21 to 29 inches; light brownish gray (10YR 6/2) gravelly clay; light gray (10YR 7/2) dry; many medium prominent red (2.5YR 4/6) mottles; weak and moderate fine subangular blocky structure; extremely hard, very firm, sticky and plastic; very few fine roots; few fine pores; about 15 percent by volume of rounded siliceous pebbles; very strongly acid; clear wavy boundary.
- B22tg—29 to 46 inches; light gray (10YR 7/2) clay; white (10YR 8/2) dry; common medium distinct strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; very hard, very firm, sticky and plastic; very few fine roots; few fine pores; about 2 percent by volume of rounded siliceous pebbles; very strongly acid; gradual wavy boundary.
- B3—46 to 67 inches; light gray (10YR 7/2) clay loam; white (10YR 8/2) dry; common medium distinct pale yellow (5Y 8/4) mottles; massive; hard, firm, sticky and slightly plastic; very few fine roots; very strongly acid; few fine white noncalcareous masses; gradual wavy boundary.
- C—67 to 80 inches; light gray (2.5Y 7/2) sandy clay loam; white (2.5Y 8/2) dry; common medium distinct red (2.5YR 4/6) mottles; massive; hard, firm, sticky and slightly plastic; very strongly acid.

Solum thickness ranges from 50 to 70 inches.

The A horizon is dark grayish brown, dark brown, or reddish brown. It ranges from 20 to 40 inches in thickness. Gravel content ranges from about 15 to 70 percent by volume of rounded siliceous pebbles. Reaction is medium acid or slightly acid.

The B2tg horizon is light gray, light brownish gray, or gray. Texture is gravelly clay or gravelly sandy clay. This horizon has common to many medium mottles in contrasting shades of red and brown. The content of rounded siliceous pebbles in the upper part of the B2tg horizon ranges from about 15 to 35 percent by volume and decreases in volume in some pedons to a few pebbles. This horizon is very strongly acid or strongly acid.

The B3 and C horizons are light gray clay loam or sandy clay loam. Medium, distinct, pale yellow, and red mottles range from few to common.

### Goldmire series

The Goldmire series consists of deep, moderately slowly permeable, moderately well drained gravelly soils on uplands. These soils formed in interbedded clayey, loamy, and gravelly deposits. Slope ranges from 1 to 5 percent. Soils of the Goldmire series are loamy-skeletal, siliceous, thermic Aquic Paleustalfs.

Geographically associated with the Goldmire soils are Tremona, Silvern, and Valco soils. Tremona and Silvern soils are on similar landforms. Valco soils are on slightly higher ridgetops.

Typical pedon of Goldmire very gravelly loamy fine sand, 1 to 5 percent slopes; from the intersection of U.S. Highway 59 and the Lower Mission Valley Road in Victoria, 13.5 miles northwest on Lower Mission Valley Road, 0.6 mile southwest on a county road, and 800 feet northwest in an area surface mined for gravel:

- Ap—0 to 3 inches; brown (7.5YR 5/4) very gravelly loamy fine sand; light brown (7.5YR 6/4) dry; single grain; loose, very friable; about 40 percent by volume of rounded siliceous pebbles; medium acid; clear smooth boundary.
- B21t—3 to 14 inches; pinkish gray (7.5YR 7/2) very gravelly sandy clay loam; pinkish white (7.5YR 8/2) dry; many coarse prominent red (2.5YR 4/8) mottles; weak fine and very fine subangular blocky structure; extremely hard, very firm; about 60 percent by volume of rounded siliceous pebbles; very strongly acid; clear wavy boundary.
- B22t—14 to 49 inches; light gray (10YR 7/1) very gravelly sandy clay loam; white (10YR 8/1) dry; many coarse prominent dusky red (10R 3/4) mottles; weak fine and very fine subangular blocky structure; extremely hard, very firm; about 60 percent by volume of rounded siliceous pebbles; very strongly acid; abrupt smooth boundary.

IIC1—49 to 63 inches; light gray (10YR 7/1) sandy clay loam; white (10YR 8/1) dry; massive; very hard, very firm; about 15 percent by volume of rounded siliceous pebbles; strongly acid; abrupt wavy boundary.

IIC2—63 to 80 inches; light gray (10YR 7/2), weakly cemented very gravelly sandy clay loam; white (10YR 8/2) dry; about 60 percent by volume of rounded siliceous pebbles; strongly acid.

Solum thickness ranges from 40 to 60 inches. Coarse fragments of rounded siliceous pebbles range from about 40 to 70 percent by volume in the Ap and B2t horizons.

The Ap horizon is brown or pale brown.

The B2t horizon is light brownish gray, pinkish gray, or light gray. Texture is very gravelly sandy clay loam or very gravelly clay loam. This horizon has common to many coarse mottles in contrasting shades of brown and red. Reaction is very strongly acid or strongly acid.

The C or IIC horizon has light gray or white clayey or loamy gravelly or nongravelly deposits of weakly cemented shale, sandstone, or sandstone conglomerate. Some of the clayey, loamy, or shaly material has mottles in contrasting shades of yellow and red.

## Inez series

The Inez series consists of deep, very slowly permeable, somewhat poorly drained loamy soils on uplands. These soils formed in clayey and loamy sediments. Slope ranges from 0 to 2 percent. Soils of the Inez series are fine, montmorillonitic, hyperthermic Typic Albaqualfs.

Geographically associated with the Inez soils are Telferner, Nada, Cieno, and Dacosta soils. Telferner soils occur on similar landforms. Nada, Cieno, and Dacosta soils are in slightly lower areas.

Typical pedon of Inez fine sandy loam, 0 to 2 percent slopes; from the intersection of U.S. Highway 59 and Farm Road 444 in Inez, 1.9 miles northwest on Farm Road 444 to J-2 Ranch Road, 1.3 miles northwest on J-2 Ranch Road to Bischoff Road, 1.4 miles northeast on Bischoff Road, and 15 feet southeast in wooded rangeland:

A1—0 to 8 inches; grayish brown (10YR 5/2) fine sandy loam; light gray (10YR 7/2) dry; common fine faint brown (10YR 4/3) and few fine distinct yellowish brown (10YR 5/6) mottles; weak fine granular structure; hard, friable; many fine and very fine roots and few medium roots; common very fine pores; slightly acid; abrupt smooth boundary.

A2—8 to 14 inches; light brownish gray (10YR 6/2) fine sandy loam; light gray (10YR 7/2) dry; common fine distinct brown (10YR 4/3) and few fine distinct yellowish brown (10YR 5/6) mottles; weak fine and very fine subangular blocky structure; hard, friable;

many fine and very fine common medium, and few coarse roots; common very fine pores; slightly acid; clear wavy boundary.

B21tg—14 to 26 inches; grayish brown (10YR 5/2) clay; light gray (10YR 7/2) dry; common fine and few medium prominent strong brown (7.5YR 5/8) mottles; weak medium and coarse prismatic structure parting to moderate fine angular blocky; extremely hard, very firm, very sticky and plastic; common fine and medium roots; few very fine pores; common pressure faces; thin patchy clay films on faces of peds; few vertically oriented coatings and interfingers of clean sand 4 to 6 millimeters wide and 2 to 3 centimeters long about 4 percent of volume; strongly acid; gradual wavy boundary.

B22tg—26 to 42 inches; gray (10YR 6/1) clay; light gray (10YR 7/1) dry; common fine and medium distinct yellowish brown (10YR 5/8) and few fine prominent yellowish red (5YR 5/8) mottles; weak medium and coarse prismatic structure parting to moderate fine angular blocky; extremely hard, very firm, very sticky and plastic; common fine and few medium roots; common pressure faces and few small slickensides; thin patchy clay films on faces of peds; few fine dark concretions; strongly acid; gradual wavy boundary.

B23tg—42 to 49 inches; gray (10YR 6/1) clay; light gray (10YR 7/1) dry; common fine and medium distinct brownish yellow (10YR 6/6) and few fine distinct yellowish brown (10YR 5/8) mottles; weak medium angular blocky structure; extremely hard, very firm, sticky and slightly plastic; few fine and medium roots; few pressure faces; thin patchy clay films on faces of peds; common fine soft dark masses and concretions; neutral; gradual wavy boundary.

B31g—49 to 70 inches; light brownish gray (10YR 6/2) clay loam; light gray (10YR 7/2) dry; common medium distinct light yellowish brown (10YR 6/4) and few fine distinct brownish yellow (10YR 6/6) mottles; weak coarse angular blocky structure; extremely hard, very firm, sticky and slightly plastic; few fine and medium roots; common fine soft dark masses and concretions; few fine soft masses of calcium carbonate; matrix noncalcareous; moderately alkaline; gradual wavy boundary.

B32g—70 to 80 inches; light gray (10YR 7/1) clay loam; light gray (10YR 7/1) dry; few fine distinct yellow (10YR 7/6) mottles; weak coarse angular blocky structure; extremely hard, very firm, very sticky and plastic; few fine roots; common medium soft dark masses and concretions; few fine soft masses of calcium carbonate; matrix noncalcareous; moderately alkaline.

Solum thickness ranges from 60 to more than 80 inches. Depth to free carbonates ranges from 38 to 80 inches. Most pedons have a few dark concretions or soft masses.



The A horizon ranges from 10 to 20 inches in thickness. It is dark gray, gray, dark grayish brown, grayish brown, light brownish gray, brown, or pale brown. Brownish, yellowish, or grayish mottles range from few to common in most pedons. This horizon is slightly acid or neutral.

The B2tg horizon is dark gray, gray, light gray, dark grayish brown, grayish brown, or light brownish gray. This horizon is clay or sandy clay that is 40 to 55 percent clay. It has few to many fine and medium mottles in contrasting shades of red, yellow, or brown. Coatings and interfingers of clean sand, mainly in the upper part, make up to 5 percent by volume. The B21tg horizon is strongly to medium acid, and the B22tg and B23tg horizons are strongly acid to neutral.

The B3g horizon is dark gray, gray, light gray, dark grayish brown, grayish brown, or light brownish gray. Texture is sandy clay, clay loam, or sandy clay loam. The B3g horizon has few to common fine mottles in contrasting shades of red, brown, or yellow. Coatings and interfingers of clean sand range from none to few. Concretions and soft masses of calcium carbonate range from none to common. This horizon is neutral to moderately alkaline.

### Kuy series

The Kuy series consists of deep, moderately permeable, moderately well drained sandy soils on uplands. The soils formed in thick sandy deposits. Slope ranges from 0 to 5 percent. Soils of the Kuy series are loamy, siliceous, hyperthermic Grossarenic Paleudalfs.

Geographically associated with the Kuy soils are Rupley, Fordtran, and Telferner soils. Rupley soils are in slightly higher areas. Fordtran and Telferner soils are on nearby uplands.

Typical pedon of Kuy loamy sand, 0 to 5 percent slopes; from the intersection of U.S. Highway 59 and Farm Road 236 southwest of Victoria, 7.8 miles southwest on U.S. Highway 59 to a paved road, 0.2 mile southeast, 0.07 mile southwest, 0.27 mile southeast, 0.05 mile northeast on a paved road and 21 feet southeast in rangeland:

A1—0 to 6 inches; light brownish gray (10YR 6/2) loamy sand; light gray (10YR 7/2) dry; single grained; loose; common fine and few medium roots; slightly acid; clear smooth boundary.

A21—6 to 40 inches; light gray (10YR 7/2) loamy sand; white (10YR 8/2) dry; single grained; loose; few fine and medium roots; slightly acid; clear smooth boundary.

A22—40 to 51 inches; white (10YR 8/2) loamy sand; white (10YR 8/2) dry; single grained; loose; few fine and medium roots; mildly alkaline; abrupt wavy boundary.

B2tg—51 to 80 inches; light gray (10YR 7/1) sandy clay loam; white (10YR 8/1) dry; many coarse prominent

strong brown (7.5YR 5/8) and few fine prominent red (2.5YR 4/8) mottles; weak fine subangular blocky structure; hard, friable, sticky and slightly plastic; few fine roots; few fine pores; few patchy clay films; strongly acid.

Solum thickness is more than 80 inches.

The A1 horizon is light brownish gray, dark yellowish brown, yellowish brown, light yellowish brown, or brown. The A2 horizon is white, yellowish brown, pale brown, or very pale brown. Thickness of the A horizon ranges from 40 to 72 inches. Reaction is slightly acid or neutral.

The B2tg horizon is light gray, light brownish gray, or pale brown. Texture is sandy clay loam or clay loam. The B2tg horizon has few to many medium to coarse, distinct or prominent mottles in contrasting shades of red, yellow, brown, or gray. It is strongly acid to slightly acid.

### Lake Charles series

The Lake Charles series consists of deep, very slowly permeable, somewhat poorly drained clayey soils on uplands. These soils formed in calcareous clayey sediments. Slope ranges from 0 to 8 percent. The soils of the Lake Charles series are fine, montmorillonitic, thermic Typic Pelluderts.

Geographically associated with the Lake Charles soils are Dacosta, Edna, and Telferner soils. Dacosta and Edna soils are in similar to slightly lower areas. Telferner soils are in slightly higher areas.

Typical pedon of Lake Charles clay, 0 to 1 percent slopes; from the intersection of Loop 175 and U.S. Highway 87 in Victoria, 6.9 miles southeast on U.S. Highway 87 to Farm Road 1686, 2.4 miles northeast on Farm Road 1686, and 290 feet north in rangeland in a microdepression:

A11—0 to 11 inches; black (10YR 2/1) clay; very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure; very hard, very firm, very sticky and plastic; many fine roots; neutral; clear wavy boundary.

A12—11 to 23 inches; black (10YR 2/1) clay; very dark gray (10YR 3/1) dry; moderate fine and medium subangular blocky structure; very hard, very firm, very sticky and plastic; few fine roots; few fine dark concretions; neutral; clear wavy boundary.

A13—23 to 46 inches; very dark gray (10YR 3/1) clay; dark gray (10YR 4/1) dry; moderate medium subangular blocky structure; extremely hard, very firm, very sticky and plastic; few fine roots; common intersecting slickensides; aggregates have shiny pressure faces; few fine dark concretions; moderately alkaline; gradual wavy boundary.

AC—46 to 54 inches; dark gray (10YR 4/1) clay; gray (10YR 5/1) dry; weak fine angular blocky structure; extremely hard, very firm, very sticky and plastic; few fine roots; common intersecting slickensides;

aggregates have shiny pressure faces; few fine dark concretions; few fine concretions of calcium carbonate; calcareous; moderately alkaline; gradual wavy boundary.

C—54 to 80 inches; very pale brown (10YR 7/3) clay; very pale brown (10YR 8/3) dry; few fine distinct light olive brown mottles; massive; extremely hard, very firm, very sticky and plastic; few intersecting slickensides; few fine dark concretions; few fine concretions of calcium carbonate; calcareous; moderately alkaline.

In undisturbed areas, gilgai microknolls are 6 to 14 inches higher than microdepressions. The center of the microknolls is 5 to 11 feet from the center of the microdepressions. When dry, these soils have cracks 1 to 2 inches wide that extend from the surface to a depth of more than 20 inches. Intersecting slickensides begin at a depth of about 20 to 30 inches.

The A horizon ranges from 6 inches in thickness in the microknolls to 50 inches in the microdepressions. It averages more than 12 inches thick in more than 60 percent of the pedon. This horizon is very dark gray or black. Some pedons have a few fine, dark concretions. The A horizon is neutral to mildly alkaline.

The AC horizon is very dark gray, dark gray, or gray. In some pedons, it has few to common medium, faint, light brownish gray or gray mottles. There are a few dark concretions in most pedons. Fine concretions of calcium carbonate range from none to common. Reaction is mildly alkaline or moderately alkaline and calcareous in some pedons.

The C horizon is gray, light brownish gray, very pale brown, or brownish yellow. It has few to common fine and medium, faint and distinct, brownish or yellowish mottles. Fine and medium concretions of calcium carbonate and fine dark concretions range from none to common.

## Leming series

The Leming series consists of deep, slowly permeable, moderately well drained to somewhat poorly drained sandy soils on uplands. These soils formed in clayey and loamy sediments. Slope ranges from 1 to 3 percent. The soils of the Leming series are clayey, mixed, hyperthermic Aquic Arenic Paleustalfs.

Geographically associated with the Leming soils are Papalote, Kuy, and Straber soils. Kuy and Straber soils are on similar landforms. Papalote soils are on slightly lower positions.

Typical pedon of Leming loamy fine sand, 1 to 3 percent slopes; from the intersection of Farm Road 236 and Farm Road 237 northwest of Mission Valley, 4.65 miles westward on Farm Road 237, 1.3 miles southwest on paved road, and 700 feet southeast in rangeland:

A1—0 to 9 inches; dark brown (10YR 4/3) loamy fine sand; brown (10YR 5/3) dry; single grained; loose; very friable; common fine roots; few very fine pores; neutral; clear smooth boundary.

A2—9 to 29 inches; dark brown (10YR 4/3) loamy fine sand; pale brown (10YR 6/3) dry; single grained; loose, very friable; few fine roots; few very fine pores; neutral; abrupt wavy boundary.

B21tg—29 to 51 inches; light brownish gray (10YR 6/2) sandy clay; light gray (10YR 7/2) dry; common medium prominent red (2.5YR 4/6) and reddish yellow (7.5YR 6/6) mottles; weak and moderate fine subangular blocky structure; hard, firm, sticky and plastic; slightly acid; clear wavy boundary.

B22t—51 to 60 inches; light brownish gray (10YR 6/2) sandy clay; light gray (10YR 7/2) dry; many coarse prominent red (2.5YR 4/6) and common fine distinct reddish yellow (7.5YR 6/8) mottles; weak fine subangular blocky structure; hard, firm, sticky and plastic; slightly acid; clear wavy boundary.

C—60 to 80 inches; red (2.5YR 4/8) sandy clay; red (2.5YR 5/8) dry; massive; very hard, very firm, sticky and slightly plastic; neutral.

Solum thickness ranges from 40 to 72 inches.

The A horizon is dark brown, brown, or pale brown.

Thickness of the A horizon ranges from 20 to 40 inches.

The B2t horizon is light brownish gray and is mottled in contrasting shades of red, yellow, and brown. Texture is clay or sandy clay. Reaction is slightly acid.

The C horizon is red. Texture is sandy clay or sandy clay loam. Reaction is neutral or moderately alkaline.

## Meguín series

The Meguín series consists of deep, moderately permeable, well drained clayey soils on flood plains. These soils formed in calcareous loamy alluvium. Slope ranges from 0 to 1 percent. The soils of the Meguín series are fine-silty, mixed, hyperthermic Fluventic Haplustolls.

Geographically associated with the Meguín soils are Trinity and Rydolph soils that are on similar landforms.

Typical pedon of Meguín silty clay, occasionally flooded; from the intersection of U.S. Highway 77 and U.S. Highway 59 in Victoria, 1.9 miles west on U.S. Highway 59, 0.9 mile south on Fordyce road, 0.14 mile northeast on county road, and 900 feet southeast in woodland:

A1—0 to 13 inches; very dark grayish brown (10YR 3/2) silty clay; dark grayish brown (10YR 4/2) dry; moderate medium subangular blocky structure; hard, friable, very sticky and plastic; common fine roots; common fine pores; calcareous; moderately alkaline; clear wavy boundary.

B21—13 to 34 inches; grayish brown (10YR 5/2) silty clay loam; light brownish gray (10YR 6/2) dry; weak



fine subangular blocky structure; slightly hard, friable, sticky and plastic; common fine roots; few fine pores; few snail shell fragments; calcareous; moderately alkaline; clear wavy boundary.

B22—34 to 62 inches; very dark grayish brown (10YR 3/2) silty clay loam; grayish brown (10YR 5/2) dry; few splotches of pale brown silt loam; moderate medium subangular blocky structure; hard, friable, very sticky and plastic; few fine roots; few fine pores; few snail shell fragments; calcareous; moderately alkaline.

B23—62 to 80 inches; brown (10YR 5/3) silty clay loam; pale brown (10YR 6/3) dry; weak fine subangular blocky structure; hard, friable, sticky and plastic; few fine roots; few fine pores; few snail shell fragments; calcareous; moderately alkaline.

Solum thickness is more than 80 inches.

The A horizon is very dark grayish brown, very dark brown, very dark gray, or black. It ranges from 8 to 20 inches in thickness. Color values of less than 3.5 extend to more than 10 inches and into the B2 horizon in some pedons.

The B2 horizon is very dark grayish brown, dark grayish brown, grayish brown, pale brown, or light brownish gray. Texture is silty clay loam or clay loam.

## Nada series

The Nada series consists of deep, very slowly permeable, poorly drained loamy soils on uplands. These soils formed in loamy sediments. Slope ranges from 0 to 1 percent. The soils of the Nada series are fine-loamy, siliceous, hyperthermic Typic Albaqualfs.

Geographically associated with the Nada soils are Cieno, Telferner, and Fordtran soils. Cieno soils are in slightly lower depressions. Telferner and Fordtran soils are on slightly higher low ridges and mounds.

Typical pedon of Nada sandy loam in an area of Nada-Cieno complex, 0 to 1 percent slopes (fig. 12); from the intersection of U.S. Highways 59 and 77 in Victoria, 2.9 miles north on U.S. Highway 77, 11.9 miles northeast on Farm Road 1315, 455 feet southeast in rangeland:

A1—0 to 8 inches; dark grayish brown (10YR 4/2) sandy loam; grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; very hard, friable; many fine roots; common fine pores; medium acid; abrupt smooth boundary.

B21tg—8 to 14 inches; dark gray (10YR 4/1) sandy clay loam; gray (10YR 5/1) dry; common medium prominent dark red (2.5YR 3/6) mottles; moderate fine blocky structure; extremely hard, very firm, very sticky; slightly acid; many fine roots; clear smooth boundary.

B22tg—14 to 25 inches; gray (10YR 5/1) sandy clay

loam; light gray (10YR 6/1) dry; many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium blocky structure; extremely hard, very firm, very sticky; common fine roots; neutral; diffuse boundary.

B23tg—25 to 35 inches; grayish brown (2.5Y 5/2) sandy clay loam; light brownish gray (2.5Y 6/2) dry; few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium blocky structure; extremely hard, very firm, very sticky; few fine roots; uncoated sand on faces of some peds; slightly saline; moderately alkaline; gradual wavy boundary.

B24tg—35 to 48 inches; light brownish gray (2.5Y 6/2) sandy clay loam; light gray (2.5Y 7/2) dry; few fine distinct yellowish brown mottles; moderate medium blocky structure; extremely hard, very firm, very sticky; few fine and medium dark masses and concretions; few fine roots; uncoated sand on faces of some peds; moderately saline; mildly alkaline; diffuse boundary.

B25tg—48 to 67 inches; light brownish gray (2.5Y 6/2) sandy clay loam; light gray (2.5Y 7/2) dry; common medium distinct yellow (2.5Y 7/6) mottles; moderate medium prismatic structure parting to moderate medium blocky; extremely hard, very firm, sticky; few fine roots; few fine and medium dark masses and concretions; moderately saline; moderately alkaline; diffuse boundary.

B3g—67 to 80 inches; light brownish gray (2.5Y 6/2) sandy clay loam; light gray (2.5Y 7/2) dry; few fine distinct yellow mottles; moderate coarse prismatic structure parting to weak coarse blocky; extremely hard, very firm, slightly sticky; few fine roots; few fine concretions of calcium carbonate; few fine and medium dark masses and concretions; slightly saline; mildly alkaline.

Solum thickness is more than 80 inches. The coefficient of linear extensibility in the upper part of the B2t horizon ranges from 0.02 to 0.08. Uncoated sand grains are on the surface of some peds, and interfingers of uncoated sand 2 to 4 centimeters long and about 1 centimeter wide range from none to a few throughout the B2tg horizon and make up to 5 percent of the matrix. Most pedons contain a few fine, dark concretions and masses. Crayfish krotovinas range from none to common. Salinity in the B and C horizons ranges from none to moderate.

The A horizon is typically less than 10 inches thick but ranges from 4 to 12 inches in thickness. It is dark grayish brown, grayish brown, light brownish gray, dark brown, brown, or pale brown. Brownish or yellowish mottles range from none to common. Reaction is medium acid to neutral.

The B2tg horizon is dark gray, gray, dark grayish brown, grayish brown, or light brownish gray. This

horizon has few to many fine and medium, distinct mottles of brown or yellow. Texture is sandy clay loam, sandy clay, or clay loam. The weighted average clay content of the control section is 27 to 35 percent. Some pedons contain a few fine concretions or soft masses of calcium carbonate in the lower part. Uncoated sand grains are on the surface of some peds. Reaction ranges from medium acid to neutral in the B21tg and B22tg horizons and from neutral to moderately alkaline in the lower part of the B2tg horizon.

The B3g horizon is light gray, gray, or light brownish gray sandy clay loam or clay loam. Brownish or yellowish mottles range from none to common. Fine and medium concretions and soft masses of calcium carbonate range from none to common. Reaction is mildly alkaline or moderately alkaline.

### Papalote series

The Papalote series consists of deep, slowly permeable, moderately well drained loamy soils on uplands. These soils formed in calcareous clayey and loamy sediments. Slope ranges from 1 to 3 percent. The soils of the Papalote series are fine, mixed, hyperthermic Aquic Paleustalfs.

Geographically associated with the Papalote soils are Sarnosa, Straber, Tremona, and Weesatche soils. Straber soils are on similar landforms. Sarnosa, Tremona, and Weesatche soils are in slightly higher areas.

Typical pedon of Papalote fine sandy loam, 1 to 3 percent slopes; from the intersection of Farm Road 237 and Farm Road 236 northwest of Mission Valley, 0.7

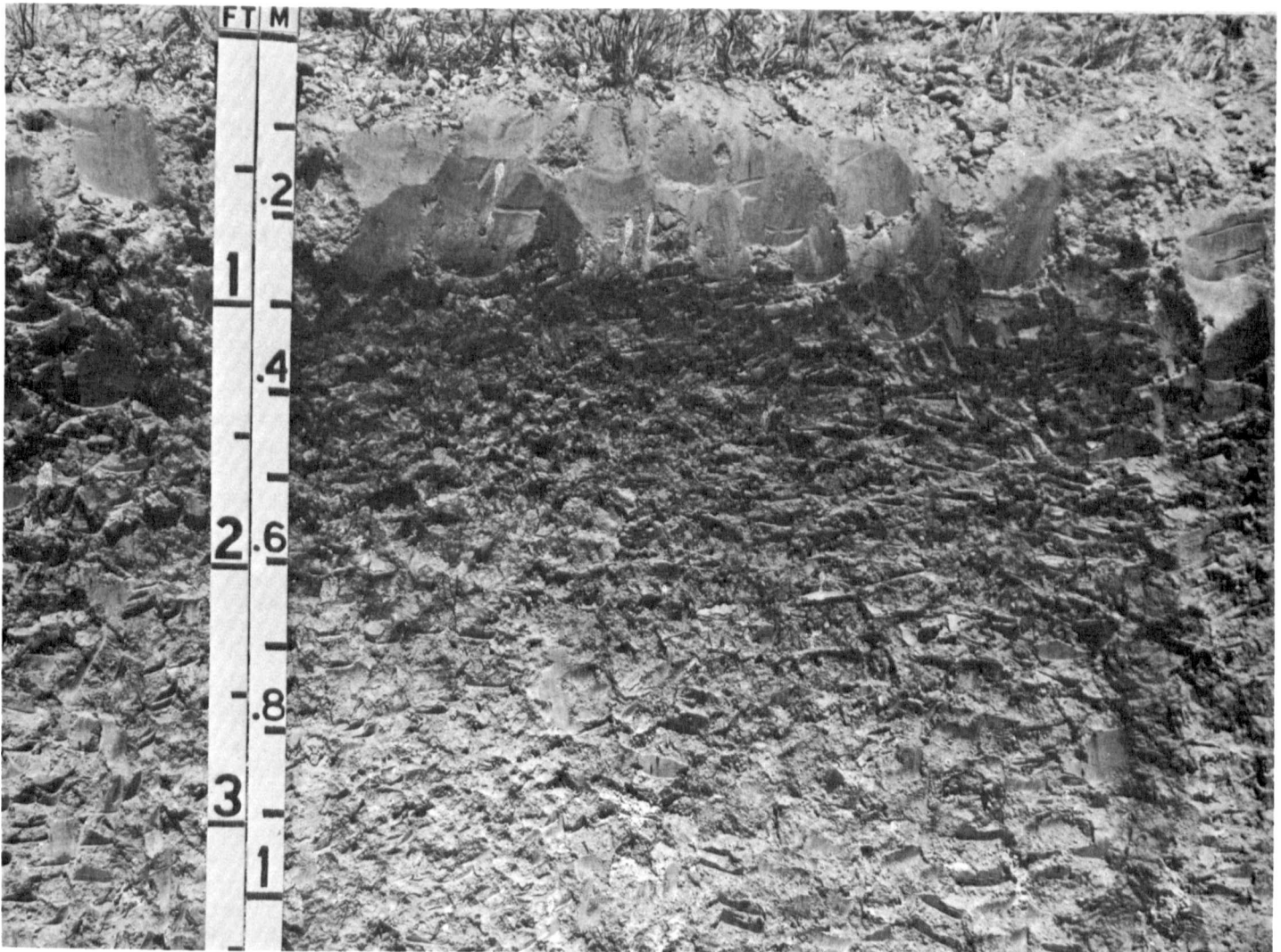


Figure 12.—Profile of Nada sandy loam. The friable surface layer rests abruptly on the very firm sandy clay loam subsoil. The dark areas are crayfish krotovinas.



mile northwest on Farm Road 236 to Albrecht Road, 1.5 miles northeast on Albrecht Road to a private road, 0.15 mile north on private road, and 50 feet east in rangeland:

- A11—0 to 5 inches; dark gray (10YR 4/1) fine sandy loam; gray (10YR 5/1) dry; weak fine granular structure; slightly hard, very friable; many fine roots; neutral; clear smooth boundary.
- A12—5 to 16 inches; dark gray (10YR 4/1) fine sandy loam; gray (10YR 5/1) dry; weak fine subangular blocky structure; slightly hard, very friable; common fine roots; neutral; clear smooth boundary.
- B21t—16 to 25 inches; very dark grayish brown (10YR 3/2) clay; dark grayish brown (10YR 4/2) dry; common medium faint dark yellowish brown (10YR 4/8) and common medium prominent red (2.5YR 4/6) mottles; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few fine roots; neutral; gradual wavy boundary.
- B22t—25 to 38 inches; grayish brown (10YR 5/2) clay; light brownish gray (10YR 6/2) dry; common medium faint dark yellowish brown (10YR 4/6) and common medium prominent red (2.5YR 4/6) mottles; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few fine roots; common thin clay films; neutral; gradual wavy boundary.
- B23t—38 to 45 inches; brown (7.5YR 5/4) clay; light brown (7.5YR 6/4) dry; many coarse prominent red (2.5YR 4/8) mottles; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few fine roots; common thin clay films; calcareous; moderately alkaline; gradual wavy boundary.
- Cca—45 to 80 inches; pink (5YR 8/4) sandy clay loam; pink (7.5YR 8/4) dry; massive; hard, firm, sticky and plastic; many fine soft masses of calcium carbonate; calcareous; moderately alkaline.

Solum thickness ranges from 40 to 55 inches. Depth to secondary carbonates is 28 to 45 inches.

The A1 horizon is dark gray or dark grayish brown. Some pedons have an A2 horizon of higher value than the A1 horizon. Reaction is slightly acid or neutral.

The B2t horizon is very dark grayish brown, dark grayish brown, dark brown, grayish brown, light yellowish brown, brown, or light gray. It has few to common medium and coarse mottles in contrasting shades of brown, yellow, or red. Texture is clay or sandy clay. A few fine concretions of calcium carbonate occur in most pedons. This horizon is slightly acid or neutral.

The B3ca horizon, if present, is yellowish red or very pale brown clay or sandy clay. It has none to common medium mottles in contrasting shades of brown, yellow, or red. Fine and medium, soft masses and concretions of calcium carbonate range from few to common.

The Cca horizon is light gray, pink, or reddish brown sandy clay loam or clay loam. Medium and coarse, soft

masses and fine and medium concretions of calcium carbonate range from common to many.

## Placedo series

The Placedo series consists of deep, very slowly permeable, very poorly drained loamy soils on flood plains. These soils formed in saline, calcareous clayey alluvium. Slope ranges from 0 to 1 percent. The soils of the Placedo series are fine, montmorillonitic, nonacid, hyperthermic Typic Fluvaquents.

Geographically associated with the Placedo soils are Austwell soils that are on slightly higher landforms.

Typical pedon of Placedo silty clay loam, frequently flooded; from the intersection of U.S. Highway 87 and Farm Road 616 in Placedo, 10.1 miles northeast on Farm Road 616 to Garcitas Creek, 4.3 miles southeast along Garcitas Creek, and 0.15 mile west in rangeland:

- A11g—0 to 12 inches; dark gray (10YR 4/1) silty clay loam; gray (10YR 5/1) dry; weak fine subangular blocky structure; hard, friable, sticky and slightly plastic; many fine roots; extremely saline; calcareous; moderately alkaline; gradual smooth boundary.
- A12g—12 to 36 inches; dark gray (5Y 4/1) clay; gray (5Y 5/1) dry; weak fine blocky structure; very hard, firm, very sticky and plastic; few fine roots; extremely saline; calcareous; moderately alkaline; gradual smooth boundary.
- Cg—36 to 60 inches; dark gray (5Y 4/1) silty clay; gray (5Y 5/1) dry; massive; very hard, firm, sticky and plastic; few fine roots; few thin strata of fine sandy loam; extremely saline; calcareous; moderately alkaline.

The clayey alluvium is more than 60 inches thick. Salinity is moderate to extreme. The soil ranges from calcareous to noncalcareous and is moderately alkaline throughout.

The A11g horizon is dark gray or gray. The A12g horizon is dark gray or light gray.

The C horizon is dark gray or light gray silty clay or clay. Some pedons have evident stratifications, and others have none.

## Runge series

The Runge series consists of deep, moderately permeable, well drained loamy soils on uplands. These soils formed in clayey and loamy sediments. Slope ranges from 0 to 5 percent. The soils of the Runge series are fine-loamy, mixed, hyperthermic Typic Argiustolls.

Geographically associated with the Runge soils are the Edna and Telferner soils on slightly lower landforms.

Typical pedon of Runge fine sandy loam, 0 to 2 percent slopes; from the intersection of Farm Road 404

and Loop 175 south of Victoria, 3.7 miles south on Farm Road 404 to a ranch road, 0.2 mile east on ranch road, and 0.1 mile north on ranch road in rangeland:

A1—0 to 9 inches; dark brown (7.5YR 3/2) fine sandy loam; dark brown (7.5YR 4/2) dry; weak fine subangular blocky structure; slightly hard, very friable; common fine roots; common very fine pores; neutral; abrupt wavy boundary.

B21t—9 to 13 inches; dark brown (7.5YR 3/2) sandy clay loam; dark brown (7.5YR 4/2) dry; moderate medium blocky structure; very hard, friable, very sticky and slightly plastic; common fine roots; few very fine pores; neutral; clear smooth boundary.

B22t—13 to 28 inches; yellowish red (5YR 4/6) sandy clay loam; yellowish red (5YR 5/6) dry; strong medium blocky structure; very hard, very firm, very sticky and slightly plastic; few fine roots; few very fine pores; neutral; gradual wavy boundary.

B3—28 to 43 inches; strong brown (7.5YR 5/6) sandy clay loam; reddish yellow (7.5YR 6/6) dry; weak fine subangular blocky structure; hard, firm, sticky and slightly plastic; few fine roots; neutral; diffuse smooth boundary.

Cca—43 to 60 inches; light yellowish brown (10YR 6/4) sandy clay loam; very pale brown (10YR 7/4) dry; massive; hard, firm, sticky and slightly plastic; about 5 percent by volume of fine and medium concretions and medium soft masses of calcium carbonate; calcareous; moderately alkaline.

Solum thickness ranges from 40 to 60 inches.

The A horizon is dark grayish brown or dark brown. The mollic epipedon ranges from 12 to 18 inches in thickness. In most pedons, it includes the A horizon; and in some pedons, it includes the upper part of the B2t horizon.

The B2t horizon is dark grayish brown, dark brown, brown, yellowish red, or reddish yellow. It is neutral or mildly alkaline.

The B3 horizon is very pale brown, strong brown, or brown. It is neutral or mildly alkaline.

The Cca horizon is light yellowish brown or reddish yellow sandy clay loam or clay loam. Fine and medium concretions and soft masses of calcium carbonate range from common to many.

The Runge soils in this survey area are taxadjuncts to the Runge series in that they do not have secondary carbonates within a depth of 36 inches. Use and management of these soils, however, are the same as for the Runge series.

## Rupley series

The Rupley series consists of deep, rapidly permeable, somewhat excessively drained sandy soils on uplands. These soils formed in thick sandy deposits. Slope ranges

from 1 to 5 percent. Soils of the Rupley series are siliceous, hyperthermic Typic Udipsamments.

Geographically associated with the Rupley soils are Dacosta, Fordtran, and Telferner soils. Dacosta, Fordtran, and Telferner soils are on surrounding nearly level broad uplands at slightly lower elevations.

Typical pedon of Rupley fine sand, 1 to 5 percent slopes; from the intersection of U.S. Highway 77 and Loop 175 southwest of Victoria, 1.38 miles south on U.S. Highway 77, and 220 feet west in rangeland:

A11—0 to 8 inches; brown (10YR 4/3) fine sand; pale brown (10YR 6/3) dry; single grained; loose; common fine roots; neutral; gradual smooth boundary.

A12—8 to 20 inches; pale brown (10YR 6/3) fine sand; very pale brown (10YR 7/3) dry; single grained; loose; few fine roots; slightly acid; gradual smooth boundary.

C1—20 to 62 inches; yellowish brown (10YR 5/4) fine sand; light yellowish brown (10YR 6/4) dry; single grained; loose; few fine roots; slightly acid; gradual smooth boundary.

C2—62 to 80 inches; light brownish gray (10YR 6/2) fine sand; light gray (10YR 7/2) dry; few medium distinct brownish yellow (10YR 6/8) and few fine faint dark yellowish brown (10YR 4/4) mottles; single grained; loose; medium acid.

The sandy sediments are over 80 inches thick; texture is fine sand or loamy fine sand.

The A horizon is dark grayish brown, grayish brown, brown, yellowish brown, dark yellowish brown, or pale brown. It ranges from 4 to 25 inches in thickness and is slightly acid to neutral.

The C horizon is grayish brown, yellowish brown, light yellowish brown, pale brown, very pale brown, brownish yellow, or light brownish gray. Brownish or yellowish streaks or mottles range from none to common in the lower part. Some pedons have loamy layers at a depth of 84 to 115 inches. This horizon is medium acid to slightly acid.

## Rydolph series

The Rydolph series consists of deep, slowly permeable, somewhat poorly drained soils on flood plains. These soils formed in calcareous clayey and loamy alluvial sediments. Slope ranges from 0 to 1 percent. Soils of the Rydolph series are fine-silty, mixed (calcareous), hyperthermic Aeric Fluvaquents.

Geographically associated with the Rydolph soils are Meguin, Trinity, and Austwell soils. Meguin and Trinity soils are on similar landforms. Austwell soils are in slightly lower areas.

Typical pedon of Rydolph silty clay, occasionally flooded (fig. 13); from the intersection of Loop 175 and U.S. Highway 77 southwest of Victoria, 11.3 miles south



on U.S. Highway 77 to Farm Road 445, 2.5 miles east on Farm Road 445, 1.2 miles south, 1.3 miles east on gravel road, and 50 feet north in rangeland:

- A1—0 to 9 inches; dark grayish brown (10YR 4/2) silty clay; light brownish gray (10YR 6/2) dry; moderate medium and fine subangular blocky structure; very hard, very firm, sticky and plastic; many fine and medium roots in upper 4 inches of horizon and common fine and very fine roots in lower 5 inches; few fine pores; few snail shell fragments; calcareous; strongly alkaline; gradual smooth boundary.
- C1—9 to 32 inches; grayish brown (10YR 5/2) loam; light gray (10YR 7/2) dry; few fine faint yellowish brown mottles; massive; very hard, very firm, slightly sticky and slightly plastic; many thin discontinuous strata of light brownish gray (10YR 6/2) very fine sand and silt; common fine and very fine roots; few snail shell fragments; slightly saline; calcareous; very strongly alkaline; clear smooth boundary.
- C2—32 to 48 inches; grayish brown (10YR 5/2) silty clay loam; light gray (10YR 7/2) dry; massive; very hard, friable, sticky and plastic; few thin discontinuous strata of very pale brown (10YR 8/3) very fine sand and silt; common fine and very fine roots; few snail shell fragments; moderately saline; calcareous; strongly alkaline; clear smooth boundary.
- C3—48 to 59 inches; brown (10YR 5/3) silt loam; very pale brown (10YR 7/3) dry; common fine faint yellowish brown and few fine distinct dark reddish brown mottles; massive; very hard, friable, slightly sticky and slightly plastic; few thin discontinuous strata of grayish brown (10YR 5/2) silt loam and very fine sand; few fine roots; few fine pores; few snail shell fragments; moderately saline; calcareous; strongly alkaline; clear smooth boundary.
- C4—59 to 71 inches; grayish brown (10YR 5/2) silty clay loam; light gray (10YR 7/2) dry; many fine faint yellowish brown mottles; weak medium and coarse subangular blocky structure; very hard, friable, sticky and plastic; few thin discontinuous strata of grayish brown (10YR 5/2) silty clay loam; few fine roots; common medium pores; common snail shell fragments; moderately saline; calcareous; strongly alkaline; clear smooth boundary.
- C5—71 to 80 inches; gray (10YR 5/1) loam, light gray (10YR 7/1) dry; massive; very hard, friable, slightly sticky and plastic; few fine pores; few snail shell fragments; moderately saline; calcareous; strongly alkaline.

The loamy and clayey alluvium is more than 80 inches thick. The 10- to 40-inch control section averages between 20 and 35 percent clay and is less than 15 percent coarser than very fine sand. Most pedons are calcareous throughout. Snail shell fragments range from none to common.

The A horizon is dark gray, dark grayish brown, or brown. In some pedons, it has a few brownish, yellowish, or grayish mottles in the lower part.

The C horizon is dark grayish brown, grayish brown, brown, pale brown, very pale brown, or gray. It has few to common fine, faint to distinct mottles in contrasting shades of brown, yellow, or gray. Few lenses and few to many thin, discontinuous strata of silt loam, silt, or very fine sand occur in most pedons. This horizon is slightly to moderately saline.

### Sarnosa series

The Sarnosa series consists of deep, moderately permeable, well drained loamy soils on uplands. These soils formed in calcareous loamy deposits. Slope ranges

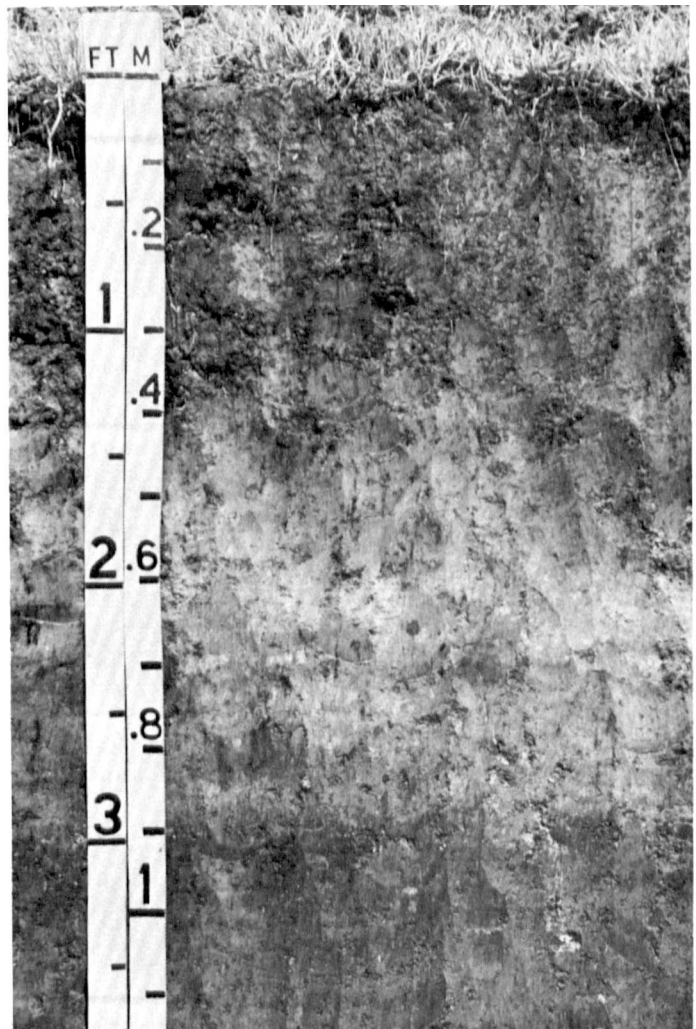


Figure 13.—Profile of Rydolph silty clay, occasionally flooded. This deep bottom land soil has layers of loam, silt loam, and silty clay loam below the surface layer.

from 1 to 3 percent. The soils of the Sarnosa series are coarse-loamy, mixed, hyperthermic Typic Calciustolls.

Geographically associated with the Sarnosa soils are Papalote and Weesatche soils. Weesatche soils occur on similar landforms. Papalote soils occur in slightly lower areas.

Typical pedon of Sarnosa loam, 1 to 3 percent slopes; from the intersection of Farm Road 236 and Farm Road 237 north of Mission Valley, 4.65 miles westward on Farm Road 237, 1.0 mile southwest on paved road, 0.1 mile southeast on gravel road, 0.1 mile southwest on gravel road, and 50 feet southeast in pastureland:

- Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) loam; dark grayish brown (10YR 4/2) dry; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; common very fine pores; few fine concretions of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.
- A1—7 to 13 inches; very dark grayish brown (10YR 3/2) loam; dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine roots; few very fine pores; calcareous; moderately alkaline; clear wavy boundary.
- B21—13 to 20 inches; brown (7.5YR 5/4) loam; light brown (7.5YR 6/4) dry; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine roots; few very fine pores; few fine concretions and soft masses of calcium carbonate; calcareous; moderately alkaline; clear wavy boundary.
- B22ca—20 to 43 inches; brown (7.5YR 5/4) loam; light brown (7.5YR 6/4) dry; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; 5 to 10 percent by volume fine and medium concretions and soft masses of calcium carbonate; calcareous; moderately alkaline; clear wavy boundary.
- Cca—43 to 70 inches; light brown (7.5YR 6/4) loam; pink (7.5YR 7/4) dry; massive; slightly hard, friable, slightly sticky and slightly plastic; 10 to 15 percent by volume fine and medium concretions and soft masses of calcium carbonate; calcareous; moderately alkaline.

Solum thickness ranges from 40 to 50 inches.

Concretions or soft masses of calcium carbonate range from a few in the A horizon to 5 to 20 percent by volume in the B2 and Cca horizons.

The A horizon is very dark grayish brown or very dark gray. It ranges from 10 to 20 inches in thickness.

The B2 horizon is light brownish gray, brown, or pale brown. It is loam or sandy clay loam that is 8 to 18 percent silicate clay in the 10- to 40-inch control section.

The Cca horizon is yellowish or brownish loam or sandy clay loam.

## Silvern series

The Silvern series consists of deep, moderately permeable, well drained very gravelly sandy soils on uplands. These soils formed in sandy and gravelly deposits. Slope ranges from 1 to 5 percent. The soils of the Silvern series are loamy-skeletal, siliceous, thermic Grossarenic Paleustalfs.

Geographically associated with the Silvern soils are Goldmire, Tremona, and Valco soils. Goldmire soils occur in slightly lower positions in surface-mined areas. Tremona and Valco soils occur in similar areas.

Typical pedon of Silvern very gravelly loamy sand, 1 to 5 percent slopes; from the intersection of Farm Road 447 and Farm Road 236 southeast of Mission Valley, 1.9 miles northwest on Farm Road 236 to Reinecke Road, 2.3 miles northeast on Reinecke Road to Lower Mission Valley Road, 0.4 mile northwest on Lower Mission Valley Road, 0.05 mile west on private road, and 100 feet south in rangeland:

- A1—0 to 12 inches; brown (10YR 5/3) very gravelly loamy sand; pale brown (10YR 6/3) dry; weak very fine granular structure; soft, very friable; few fine roots; about 50 percent by volume rounded siliceous pebbles; medium acid; clear smooth boundary.
- A2—12 to 46 inches; pink (7.5YR 7/4) very gravelly loamy sand; pink (7.5YR 8/4) dry; single grained; loose; few fine roots; about 70 percent by volume rounded siliceous pebbles; medium acid; abrupt wavy boundary.
- B21t—46 to 70 inches; dark red (10R 3/6) very gravelly sandy clay loam; dark red (10R 3/6) dry; many coarse prominent light brownish gray (10YR 6/2) mottles; weak fine granular structure; hard, firm, sticky and slightly plastic; about 80 percent by volume rounded siliceous pebbles; very strongly acid.

Solum thickness ranges from 60 to more than 80 inches.

The A1 horizon is grayish brown or brown. The A2 horizon is pink. Thickness of the A horizon ranges from 40 to 60 inches. The content of rounded siliceous pebbles ranges from about 35 to 75 percent by volume. These horizons are medium acid or slightly acid.

The B2t horizon is dark red or yellowish red. Texture is very gravelly sandy clay loam or very gravelly sandy loam. The B2t horizon has many mottles in contrasting shades of gray. The content of rounded siliceous pebbles ranges from about 50 to 80 percent by volume. Reaction is very strongly acid or extremely acid.

## Sinton series

The Sinton series consists of deep, moderately permeable, well drained loamy soils on flood plains. These soils formed in calcareous loamy alluvium. Slope



ranges from 0 to 1 percent. The soils of the Sinton series are fine-loamy, mixed hyperthermic Cumulic Haplustolls.

Geographically associated with the Sinton soils are Meguin and Trinity soils that are on similar flood plains.

Typical pedon of Sinton loam, occasionally flooded; from the intersection of Farm Road 447 and U.S. Highway 87 in Nursery, 3.7 miles northwest on U.S. Highway 87 to a dirt road, 1.25 miles southwest on dirt road, 0.35 mile south on field road in improved pasture:

- A1—0 to 12 inches; black (10YR 2/1) loam; very dark gray (10YR 3/1) dry; weak fine granular and subangular blocky structure; slightly hard, friable, slightly sticky, nonplastic; common fine roots; few fine pores; calcareous; moderately alkaline; clear wavy boundary.
- A12—12 to 24 inches; very dark gray (10YR 3/1) loam; dark gray (10YR 4/1) dry; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky, nonplastic; common fine roots; few fine pores; calcareous; moderately alkaline; clear smooth boundary.
- C1—24 to 50 inches; dark grayish brown (10YR 4/2) loam; grayish brown (10YR 5/2) dry; massive; slightly hard, friable, slightly sticky and nonplastic; few fine roots; calcareous; moderately alkaline; clear smooth boundary.
- C2—50 to 67 inches; dark brown (10YR 4/3) loam; brown (10YR 5/3) dry; massive; slightly hard, friable, slightly sticky and nonplastic; calcareous; moderately alkaline; clear smooth boundary.
- C3—67 to 80 inches; dark grayish brown (10YR 4/2) sandy clay loam; grayish brown (10YR 5/2) dry; massive; slightly hard, friable, sticky and slightly plastic; calcareous; moderately alkaline.

The loamy alluvium is more than 80 inches thick. The 10- to 40-inch control section is 20 to 35 percent clay and more than 15 percent fine sand. Snail shell fragments range from none to common.

The A horizon is black, very dark gray, very dark grayish brown, or very dark brown. It ranges from 20 to 40 inches in thickness.

The C horizon is dark grayish brown, grayish brown, or brown. It is loam or silt loam, sandy clay loam, and clay loam with bedding planes and lenses of these various textures. Some pedons have a few films and threads of calcium carbonate below a depth of 24 inches.

## Straber series

The Straber series consists of deep, slowly permeable, moderately well drained sandy soils on uplands. These soils formed in clayey and loamy sediments. Slope ranges from 0 to 5 percent. Soils of the Straber series are fine, mixed, thermic Aquic Paleustalfs.

Geographically associated with the Straber soils are Telferner, Papalote, and Tremona soils. Tremona soils are on similar landforms. Telferner and Papalote soils are in slightly lower areas.

Typical pedon of Straber loamy fine sand, 0 to 2 percent slopes; from the intersection of Farm Road 236 and Farm Road 237 north of Mission Valley, 3 miles southwest on Farm Road 237 to the intersection of Farm Road 237 and Dentler Road, 1.5 miles northwest on Dentler Road to a gravel road, 0.9 mile northeast on a gravel and dirt road, and 10 feet north in rangeland:

- A1—0 to 9 inches; pale brown (10YR 6/3) loamy fine sand, very pale brown (10YR 7/3) dry; weak fine granular structure; loose, very friable; few fine roots; slightly acid; clear smooth boundary.
- A2—9 to 13 inches; very pale brown (10YR 7/3) loamy fine sand, very pale brown (10YR 8/3) dry; single grain; loose, very friable; few fine roots; slightly acid; abrupt wavy boundary.
- B21t—13 to 22 inches; mottled strong brown (7.5YR 5/8), light brownish gray (2.5Y 6/2), and red (2.5YR 4/6) clay; weak medium angular blocky structure; very hard, very firm, sticky and plastic; few fine roots; few clay films; very strongly acid; gradual wavy boundary.
- B22t—22 to 46 inches; light gray (2.5Y 7/2) clay, white (2.5Y 8/2) dry; common medium prominent reddish yellow mottles (5YR 6/8); weak medium angular blocky structure; extremely hard, very firm, sticky and plastic; few clay films; strongly acid; gradual wavy boundary.
- C—46 to 65 inches; light gray (2.5Y 7/2) sandy clay, white (2.5Y 8/2) dry; common fine prominent strong brown (7.5YR 5/8) mottles; massive; very hard, firm, sticky and plastic; common fine dark masses; slightly acid.

Solum thickness ranges from 40 to 50 inches.

The A horizon is 10 to 20 inches thick in more than 50 percent of the pedon; it ranges from 7 inches in thickness over subsoil crests to 20 inches in subsoil troughs. The A horizon is pale brown, very pale brown, light brownish gray, or brown. Some pedons that have the thicker A horizon have a thin, discontinuous A2 horizon of higher value than the A1 horizon. The A horizons are medium acid or slightly acid.

The B2t horizon is yellowish brown, strong brown, light brownish gray, or pale brown or has a mottled matrix. It has common to many medium and coarse mottles in contrasting shades of brown, yellow, or red. This horizon is very strongly acid or strongly acid.

The C horizon is light gray and has common, fine mottles in contrasting shades of brown. Some pedons have fine, dark concretions and a few fine concretions of calcium carbonate below a depth of 40 inches. This horizon is slightly acid or neutral.

Straber loamy fine sand, 2 to 5 percent slopes, in this survey area is a taxadjunct to the series. It is slightly more alkaline in the upper part of the B2t horizon than is modal for the series. This difference, however, does not affect the use and management of the soil.

### Telferner series

The Telferner series consists of deep, very slowly permeable, somewhat poorly drained loamy soils on uplands. These soils formed in clayey and loamy sediments. Slope ranges from 0 to 3 percent. The soils of the Telferner series are fine, montmorillonitic, hyperthermic Typic Albaqualfs.

Geographically associated with the Telferner soils are the Cieno, Edna, Dacosta, Fordtran, and Nada soils. Edna and Dacosta soils are on similar landforms. Fordtran soils are in slightly higher areas. Cieno and Nada soils are in slightly lower areas.

Typical pedon of Telferner fine sandy loam, 0 to 1 percent slopes; from the intersection of U.S. Highway 59 and Farm Road 1686 in Telferner, 1.1 miles northeast on U.S. Highway 59, and 85 feet north in rangeland:

- A1—0 to 10 inches; dark grayish brown (10YR 4/2) fine sandy loam; light brownish gray (10YR 6/2) dry; few fine faint dark brown mottles; weak fine granular structure; slightly hard, friable; many fine roots; common fine and medium pores; slightly acid; clear smooth boundary.
- A2g—10 to 16 inches; light brownish gray (10YR 6/2) fine sandy loam; light gray (10YR 7/2) dry; few fine faint dark brown mottles; massive; slightly hard, friable; common fine roots; common fine and medium pores; slightly acid; abrupt wavy boundary.
- B21tg—16 to 24 inches; grayish brown (10YR 5/2) sandy clay; light brownish gray (10YR 6/2) dry; common coarse distinct yellowish brown (10YR 5/6) and few medium prominent yellowish red (5YR 4/6) mottles; moderate medium and coarse blocky structure; very hard, very firm, very sticky and plastic; few fine roots; few fine pores; many thin clay films; slightly acid; gradual wavy boundary.
- B22tg—24 to 40 inches; light brownish gray (10YR 6/2) clay loam; light gray (10YR 7/2) dry; common coarse distinct yellowish brown (10YR 5/6) mottles; moderate coarse blocky structure; very hard, very firm, very sticky and plastic; few fine roots; few fine pores; many thin clay films; few fine dark concretions; slightly acid; gradual wavy boundary.
- B23tg—40 to 50 inches; light gray (10YR 7/2) clay loam; white (10YR 8/2) dry; common coarse distinct brownish yellow (10YR 6/6) mottles; weak coarse blocky structure; very hard, very firm, slightly sticky and plastic; few fine pores; few thin clay films; few fine dark concretions; mildly alkaline; gradual smooth boundary.

B3—50 to 80 inches; light gray (10YR 7/2) sandy clay loam; white (10YR 8/2) dry; common coarse faint light yellowish brown (10YR 6/4) mottles; weak coarse blocky structure; hard, friable, slightly sticky and plastic; calcareous; moderately alkaline.

Solum thickness ranges from 60 to more than 80 inches. Some pedons have a few fine concretions of calcium carbonate below a depth of 38 inches and disseminated fine concretions and soft masses of calcium carbonate below a depth of 60 inches.

The combined thickness of the A horizons is more than 12 inches in more than 50 percent of any pedon and ranges to 20 inches in subsoil troughs. The A1 horizon is very dark grayish brown, dark grayish brown, dark gray, light brownish gray, or grayish brown. The A2g horizon is light brownish gray, white, or light gray. In some pedons, it has a few fine, faint, dark brown mottles. This horizon is slightly acid or neutral.

The B2tg horizon is dark grayish brown, light brownish gray, or grayish brown. Texture is clay, clay loam, or sandy clay. This horizon has few to common medium and coarse, prominent and distinct mottles in contrasting shades of brown or red. Most pedons have a few fine, dark concretions. Reaction is slightly acid to moderately alkaline.

The B3 horizon is grayish brown, light brownish gray, pale brown, light gray, or light yellowish brown. Texture is sandy clay or sandy clay loam.

### Tremona series

The Tremona series consists of deep, very slowly permeable, somewhat poorly drained gravelly and sandy soils on uplands. These soils formed in interbedded clayey, loamy, and gravelly deposits. Slope ranges from 1 to 3 percent. Soils of the Tremona series are clayey, mixed, thermic Aquic Arenic Paleustalfs.

Geographically associated with the Tremona soils are Straber, Silvern, Weesatche, and Papalote soils. Straber, Silvern, and Weesatche soils are on similar landforms. Papalote soils are in slightly lower areas.

Typical pedon of Tremona gravelly loamy sand, 1 to 3 percent slopes; from the intersection of Farm Roads 237 and 236 northwest of Mission Valley, 0.7 mile northwest on Farm Road 236 to Albrecht Road, 1.5 miles northeast on private road, and 1,300 feet northeast in rangeland:

- A1—0 to 10 inches; dark brown (10YR 4/3) gravelly loamy sand; brown (10YR 5/3) dry; very weak fine granular structure; soft and very friable; few fine roots; few fine pores; about 20 percent by volume of rounded siliceous pebbles; slightly acid; clear smooth boundary.
- A2—10 to 35 inches; very pale brown (10YR 7/4) very gravelly loamy sand; very pale brown (10YR 7/4) dry; single grained; loose; few fine roots; about 75



percent by volume of rounded siliceous pebbles; slightly acid; abrupt wavy boundary.

B21t—35 to 42 inches; light brownish gray (10YR 6/2) sandy clay; light gray (10YR 7/2) dry; common coarse prominent red (10R 4/6) mottles; weak and moderate medium subangular blocky structure; extremely hard, very firm, sticky and plastic; very few fine roots; about 3 percent by volume of rounded siliceous pebbles; very strongly acid; gradual wavy boundary.

B22t—42 to 56 inches; light brownish gray (10YR 6/2) sandy clay; light gray (10YR 7/2) dry; few fine distinct strong brown (7.5YR 5/6) mottles; weak and moderate medium subangular blocky structure; extremely hard, very firm, sticky and plastic; about 3 percent by volume of rounded siliceous pebbles; very strongly acid; gradual wavy boundary.

B3—56 to 80 inches; pale brown (10YR 6/3) sandy clay loam; very pale brown (10YR 7/3) dry; common coarse distinct reddish yellow (7.5YR 6/6) mottles; weak medium blocky structure; extremely hard, firm, slightly sticky and plastic; strongly acid.

Solum thickness ranges from 50 to 80 inches.

The A1 horizon is dark grayish brown, dark brown, or brown. The A2 horizon is very pale brown. Thickness of the A horizon ranges from 20 to 40 inches. The content of rounded siliceous pebbles ranges from 10 to 30 percent by volume in the A1 horizon and from 50 to 70 percent in the A2 horizon. Reaction is medium acid to slightly acid.

The B2t horizon is light brownish gray, gray, or grayish brown sandy clay or clay. This horizon has few to many mottles in contrasting shades of brown or red. The content of rounded siliceous pebbles ranges from about 3 to 15 percent by volume. This horizon is very strongly acid to medium acid.

The B3 horizon is pale brown and has coarse mottles in shades of yellow.

## Trinity series

The Trinity series consists of deep, very slowly permeable, somewhat poorly drained clayey soils on flood plains. These soils formed in calcareous alluvial sediments. Slope ranges from 0 to 1 percent. The soils of the Trinity series are very-fine, montmorillonitic, thermic Typic Pelluderts.

Geographically associated with the Trinity soils are Sinton, Rydolph, and Meguin soils. These soils are on similar flood plains.

Typical pedon of Trinity clay, frequently flooded; from the intersection of Loop 175 and U.S. Highway 77 southwest of Victoria, 11.3 miles south on U.S. Highway 77 to San Antonio River Road, 6.05 miles in a westerly direction on San Antonio River Road, 0.45 mile southwest, 0.75 mile southeast on field road, and 4 feet east in rangeland:

A11—0 to 13 inches; very dark gray (10YR 3/1) clay; dark gray (10YR 4/1) dry; weak fine subangular blocky structure; very hard, very firm, very sticky and plastic; common fine roots; few fine pores; calcareous; moderately alkaline; clear wavy boundary.

A12—13 to 25 inches; very dark gray (10YR 3/1) clay; dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; very hard, very firm, very sticky and plastic; few fine roots; few intersecting slickensides; calcareous; moderately alkaline; clear wavy boundary.

AC—25 to 60 inches; dark gray (10YR 4/1) clay; gray (10YR 5/1) dry; few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; very hard, very firm, very sticky and plastic; few fine roots; few intersecting slickensides; calcareous; moderately alkaline; clear wavy boundary.

C—60 to 80 inches; gray (10YR 5/1) clay; light gray (10YR 6/1) dry; common fine distinct dark yellowish brown (10YR 4/6) mottles; massive; very hard, very firm, very sticky and plastic; common intersecting slickensides; calcareous; moderately alkaline.

The clayey sediments are more than 80 inches thick. The 10- to 40-inch control section is 60 to 80 percent clay. When dry, these soils have cracks 1 to 2 inches wide that extend from the surface to a depth of more than 20 inches.

The A horizon is black or very dark gray. In some pedons, it has few to common mottles in contrasting shades of gray and brown in the lower part.

The C horizon is very dark gray, dark gray, gray, dark grayish brown, or grayish brown. Mottles in shades of brown range from few to many.

## Valco series

The Valco series consists of shallow, moderately permeable, well drained loamy soils on uplands. These soils formed in calcareous loamy sediments. Slope ranges from 2 to 8 percent. The soils of the Valco series are loamy, mixed, hyperthermic, shallow Petrocalcic Calciustolls.

Geographically associated with the Valco soils are Weesatche, Sarnosa, and Straber soils. The associated soils are on slightly lower uplands.

Typical pedon of Valco clay loam, 2 to 8 percent slopes; from the intersection of Farm Road 236 and Farm Road 447 southeast of the town of Mission Valley, 1.4 miles northeast on Farm Road 447 to Lower Mission Valley Road, 1.9 miles southeast on Lower Mission Valley Road, 1.1 miles northeast and 0.15 mile southeast on private road, and 0.1 mile northeast and 264 feet southeast in rangeland:

A11—0 to 10 inches; very dark brown (10YR 2/2) clay loam; very dark grayish brown (10YR 3/2) dry;

moderate medium subangular blocky structure parting to very fine and fine granular; slightly hard, friable; many fine roots; few fine snail shells; few siliceous pebbles; about 20 to 35 percent by volume soft powdery masses and weakly cemented fragments of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

A12—10 to 15 inches; dark grayish brown (10YR 4/2) clay loam; grayish brown (10YR 5/2) dry; moderate medium subangular blocky structure parting to very fine and fine granular; slightly hard, friable; common fine roots; few siliceous pebbles; about 15 percent by volume of caliche fragments, and about 30 percent by volume soft powdery masses of calcium carbonate; calcareous; moderately alkaline; abrupt smooth boundary.

Ccam—15 to 17 inches; white (10YR 8/1), weakly cemented caliche with soil material along fractures and in old solution cavities; calcareous; moderately alkaline; abrupt smooth boundary.

Cca—17 to 40 inches; white (10YR 8/1), weakly cemented and soft powdery caliche with a few fine and medium masses of very pale brown loamy soil materials; few medium and coarse concretions of calcium carbonate; calcareous; moderately alkaline.

Solum thickness ranges from 8 to 20 inches. The content of siliceous pebbles ranges from 1 to about 15 percent by volume. Caliche fragments range from 1 to 15 percent by volume, and weakly cemented to soft, powdery masses of calcium carbonate range from 20 to 30 percent by volume.

The A1 horizon is very dark brown or dark grayish brown clay loam. Thickness of the A horizon ranges from 8 to 20 inches.

The Ccam horizon is about 1 to 4 inches thick. In some pedons, this horizon has a thin-layered laminar cap up to 1 centimeter thick.

The Cca horizon is white, light gray, brown, or pink. It is weakly cemented, soft, powdery caliche and loamy soil materials.

The Valco soils in this survey area are taxadjuncts to the Valco series in that the calcium carbonate equivalent is more than 40 percent. This difference, however, does not affect the use and management of the soils.

## Weesatche series

The Weesatche series consists of deep, moderately permeable, well drained loamy soils on uplands. These soils formed in calcareous loamy deposits. Slope ranges from 1 to 5 percent. The soils of the Weesatche series are fine-loamy, mixed, hyperthermic Typic Argiustolls.

Geographically associated with the Weesatche soils are Papalote, Sarnosa, Tremona, and Valco soils. Papalote soils are on slightly lower uplands. Sarnosa and Tremona soils are on similar uplands. Valco soils are on slightly higher uplands.

Typical pedon of Weesatche sandy clay loam, 1 to 3 percent slopes; from the intersection of Farm Roads 236 and 237 near Mission Valley, 1.3 miles southwest on Farm Road 237, and 140 feet northwest in rangeland:

A11—0 to 7 inches; black (10YR 2/1) sandy clay loam; dark gray (10YR 4/1) dry; weak and moderate fine and medium granular structure; slightly hard, very firm, sticky and plastic; many fine roots; common fine pores; neutral; clear smooth boundary.

A12—7 to 13 inches; very dark gray (10YR 3/1) sandy clay loam; dark gray (10YR 4/1) dry; moderate fine and medium granular and weak fine subangular blocky structure; hard, firm, sticky and plastic; few fine roots; common fine pores; mildly alkaline; gradual smooth boundary.

B2t—13 to 35 inches; dark reddish brown (5YR 3/4) sandy clay loam; reddish brown (5YR 4/4) dry; moderate medium and coarse subangular blocky structure; hard, firm, sticky and plastic; very few fine roots; few fine pores; common thick clay films on ped faces; moderately alkaline; abrupt wavy boundary.

Cca—35 to 60 inches; light brown (7.5YR 6/4) loam; pink (7.5YR 7/4) dry; massive; slightly hard, friable, sticky and slightly plastic; many fine soft masses and weakly cemented concretions of calcium carbonate; calcareous; moderately alkaline.

Solum thickness ranges from 35 to 40 inches. Depth to layers containing concretions and soft masses of calcium carbonate ranges from 23 to 37 inches. In some pedons, 5 to 15 percent of the volume is rounded siliceous pebbles.

The A horizon is black, very dark gray, or dark brown. It ranges from 8 to 16 inches in thickness. It is neutral or mildly alkaline.

The B2t horizon is dark reddish brown, yellowish red, light brown, or dark brown. Texture is clay loam or sandy clay loam. This horizon is mildly alkaline or moderately alkaline.

The Cca horizon is light brown or reddish yellow. Texture is loam, sandy clay loam, or fine sandy loam. Soft masses and fine concretions of calcium carbonate range from 20 to 40 percent by volume.

## Zalco series

The Zalco series consists of deep, rapidly permeable, somewhat excessively drained sandy soils on flood plains. These soils formed in calcareous sandy alluvium. Slope ranges from 0 to 1 percent. The soils of the Zalco series are sandy siliceous, hyperthermic Typic Udifluvents.

Geographically associated with the Zalco soils are Sinton and Meguin soils, which are on similar positions on flood plains.



Typical pedon of Zalco fine sand, frequently flooded (fig. 14); from the intersection of U.S. Highway 77 and Farm Road 446 southwest of Victoria, 4.2 miles southwest on Farm Road 446 to southwest side of Coletto Creek, 0.1 mile west along Coletto Creek, and 2 feet south in rangeland:

- A1—0 to 4 inches; brown (10YR 5/3) fine sand; pale brown (10YR 6/3) dry; single grained; loose; common fine roots; moderately alkaline; clear smooth boundary.
- C1—4 to 19 inches; brown (10YR 5/3) fine sand; pale brown (10YR 6/3) dry; single grained; loose; many thin strata of fine sandy loam; few fine roots; calcareous; moderately alkaline; clear smooth boundary.
- C2—19 to 27 inches; grayish brown (10YR 5/2) loamy fine sand; light brownish gray (10YR 6/2) dry; single grained; massive; loose; many thin strata of fine sandy loam; calcareous; moderately alkaline; clear wavy boundary.
- C3—27 to 37 inches; brown (10YR 5/3) loamy fine sand; very pale brown (10YR 7/3) dry; massive; loose; few thin strata of loam and fine sandy loam; calcareous; moderately alkaline; clear wavy boundary.
- C4—37 to 49 inches; dark grayish brown (10YR 4/2) fine sandy loam; light brownish gray (10YR 6/2) dry; massive; loose; very friable; many thin strata of loamy fine sand; calcareous; moderately alkaline; gradual smooth boundary.
- C5—49 to 80 inches; brown (10YR 5/3) fine sand; pale brown (10YR 6/3) dry; single grained; loose; calcareous; moderately alkaline.

The sandy alluvial sediments are more than 80 inches thick. Texture is fine sand or loamy fine sand. Thin strata of loamy texture are throughout the C horizon. The soil is neutral through moderately alkaline throughout and in most pedons is calcareous.

The A horizon is grayish brown, light gray, very pale brown, pale brown, brown, or light yellowish brown.

The C horizon is grayish brown, dark grayish brown, light gray, very pale brown, brown, or light yellowish brown.

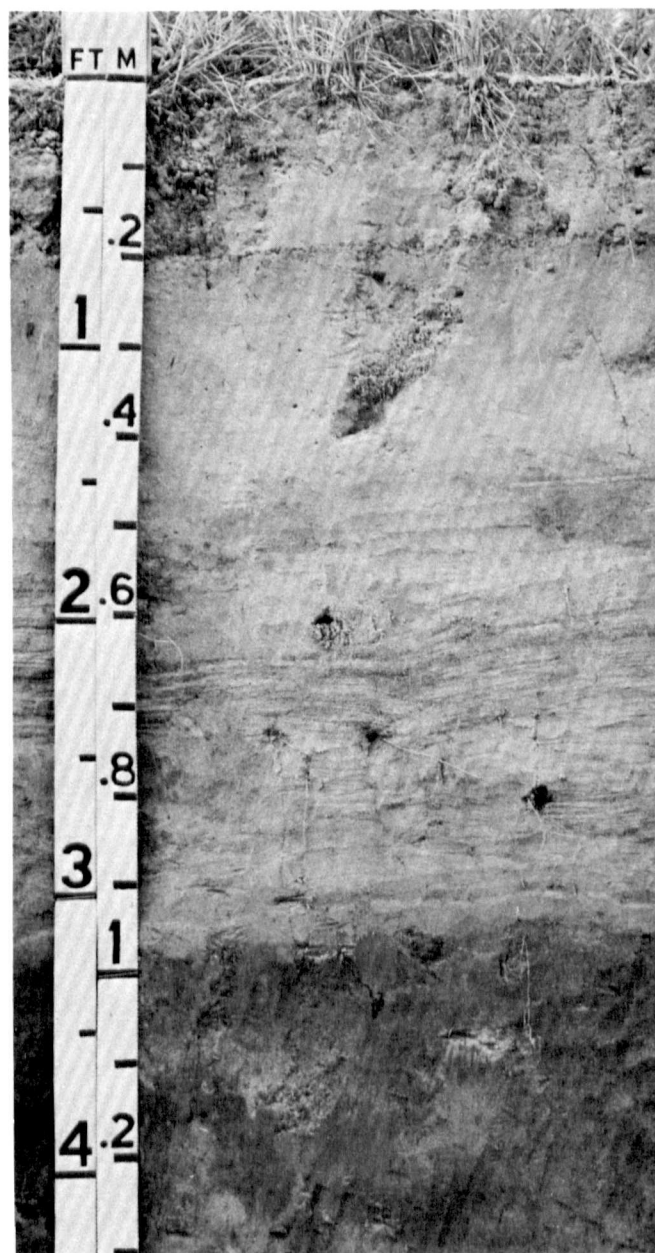


Figure 14.—Profile of Zalco fine sand, frequently flooded.  
This soil is mostly sandy, but it has many thin loamy strata.





# factors of soil formation

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Soil is produced by the action of soil-forming processes on material deposited or accumulated by geologic agencies. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material, the climate under which the soil material has accumulated and existed since accumulation, the plant and animal life on and in the soil, the relief, and the length of time these forces have acted on the soil material.

Climate and living organisms are active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it into a natural body that has genetically related horizons. The effects of climate and living organisms are conditioned by relief. The parent material also affects the kind of profile that can be formed and, in extreme cases, determines it almost entirely. Finally, time is needed for the changing of the parent material into a soil profile. It may be long or short, but some time is always needed for horizon differentiation. Usually, a long time is needed for distinct horizons to develop.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. Each factor is discussed separately, however, and the probable effects of each are indicated.

## parent material

Parent material is the unconsolidated mass from which a soil forms. It determines the chemical and mineral composition of the soil. The soils in Victoria County formed in loamy and clayey sediments deposited by ancient streams and rivers. In some areas, terrace or windblown sands are found. Some of the loamy and clayey sediments have been reworked and modified by wind action. The geology of the parent material is described in the section "Surface geology."

## climate

Precipitation, temperature, and wind have had a major effect on the formation of soils in Victoria County.

In past geologic ages, wetter or drier climates had an effect on how the parent material was deposited. The

gravelly parent material of the Goldmire and Garcitas soils was deposited by rivers in a wetter climate. The sandy parent material of the Kuy and Rupley soils was deposited by wind in the drier climate. The loamy and clayey parent material of the Dacosta and Lake Charles soils was deposited by rivers in a climate similar to the present one.

The present climate of Victoria County is humid subtropical and is uniform throughout the county. The dominant climatic influence on soil formation in the county has been the precipitation, which has caused the translocation of carbonates and clays. The moderate amount of rainfall has promoted moderately rapid soil formation.

## plant and animal life

Plants, micro-organisms, earthworms, and other forms of life on and in the soil are active in soil-forming processes. They provide organic matter, help to decompose plant residue, influence the chemistry of the soil, and contribute to soil development. Gains in organic matter and nitrogen in the soil, gains or losses in plant nutrients, and changes in structure and porosity are some of the changes caused by plant and animal life.

Prairie vegetation was the dominant native vegetation in most of the county. It caused soils such as Dacosta, Lake Charles, and Faddin soils to have a dark surface layer that contains an appreciable amount of organic matter. In some parts of the county, however, the native vegetation was dominantly woody plants, and as a result, soils such as Straber and Kuy soils have a lighter colored surface layer with less organic matter than soils formed under prairie vegetation.

## relief

Relief influences soil formation through its effect on drainage and runoff. If other factors are equal, the degree of profile development depends mainly on the average amount of moisture in the soil. The nearly level soils, such as Nada soils, absorb more moisture and generally have a better developed profile than steeper soils, such as Valco soils, which erode almost as fast as they form.

Relief also affects the kind and amount of vegetation on a soil. For example, slopes that face north and east receive less direct sunlight than those facing south and west; and, therefore, they lose less moisture through evaporation. As a result, the vegetation is usually denser on slopes facing north and east.

Nearly level soils or those in slightly concave positions, such as Dacosta soils, receive more runoff than sloping soils and produce more vegetation; consequently, they generally have more organic matter, which imparts a darker color.

## **time**

The length of time that the soil-forming factors have acted on the parent material determines, to a large degree, the characteristics of the soil. Time, usually a long time, is required for formation of soils that have distinct horizons. In Victoria County, Rydolph and Zalco soils are young soils, which show little profile development. Dacosta soils are examples of soils that have been acted upon for a long time by soil-forming processes. These soils have better developed horizons and are deeper than other soils.



## surface geology

By Saul Aronow, Department of Geology, Lamar University, Beaumont, Texas.

Victoria County is within the West Gulf Coastal Plain geomorphic province (8). The geologic formations crop out in broad, gulf-parallel bands and dip gently gulfward. The formations are cut in many places by gulfward-dipping normal faults (9). The faults and associated folds make up the traps of the many oilfields and gasfields in the county.

The parent materials of the soils range in age from the Holocene Alluvium, less than 12,000 years old, to the Miocene Goliad Formation, more than 7 million years old.

The general soil map units can be roughly correlated with the geologic units shown on maps of the Geologic Atlas of Texas (19, 20). The relationships between the geologic units and the general soil map units are summarized in table 22.

The Goliad Formation of Miocene age, the oldest surface formation in the county, is between 7 and 13 million years old and underlies most of the Weesatche-Papalote map unit and part of the Straber map unit.

As observed in road cuts and pits, mainly on the western side of the Guadalupe River, the Goliad Formation is made up principally of caliche, which is a secondary accumulation of massive, chalky to nodular calcium carbonate that may exceed 15 feet in thickness. The calcium carbonate in the caliche was probably originally deposited in calcareous loess, a fine-grained, wind-transported material (6, 11). The calcium carbonate in the loess was dissolved and transported downward by percolating rainwater to be precipitated in the underlying sediments. The calcium carbonate first filled the pore space in these sediments. In time, the fabric of the sediments was disrupted by precipitation and the clastic components of the sediments were isolated. The clastic components now "float" in a matrix of calcium carbonate (5, 6). The mode and time of origin of the caliche, as well as its later fate, have considerable bearing on the nature of the soils that overlie it.

Outside of Victoria County, the Goliad Formation is at the surface in many places and is made up of clayey, loamy, sandy, and gravelly sediments as well as caliche. Because of these two different surface aspects of the Goliad Formation, younger formations in which caliche has formed have been identified as the Goliad Formation in geologic mapping, and areas of the Goliad Formation

that do not have caliche have been identified as older formations.

The Goliad Formation, by virtue of the caliche at the surface, holds up an extensive flat surface variously described as the Reynosa Plateau, or Reynosa Cuesta (10, 11), which dips gently to the southeast and vanishes under the younger formations. This plateau is a well-defined topographic feature and begins approximately on the western side of the Guadalupe River in Victoria County. Less well-defined parts on the northern and eastern sides of the river can be traced through DeWitt and Lavaca counties where, near Hallettsville in Lavaca County, they disappear as a surface feature. The plateau extends southward to the Rio Grande River and into Mexico.

Of the major soils overlying the Goliad Formation (Weesatche, Papalote, Sarnosa, Tremona, Valco) only in the Valco soils does the upper part of the caliche qualify as a petrocalcic horizon. The Valco soils in DeWitt County have been described as weakly laminar in the upper part of the C horizon (17). According to Gile and others (6), this laminar zone represents an accumulation above the "plugged" lower caliche layers after effective downward drainage has diminished or ceased due to occupation of permeable passageways by calcium carbonate. A laminar zone can be seen in some places in Victoria County.

The depth to caliche in areas of the Weesatche, Papalote, Sarnosa, and Tremona soils suggests that percolating water during earlier periods of higher rainfall leached out part of the calcium carbonate. The caliche is no longer in an accumulative stage. The Valco soils may occur in places where the dissolution of the caliche has been slower or where a thicker layer of caliche that had been leached of calcium carbonate has been thinned by erosion.

The first episode of calcareous loess deposition and the subsequent formation of caliche probably took place during or shortly after the deposition of the Goliad during the Miocene Epoch. Crossbedded fluvial caliche rubble and siliceous pebbles have been observed in some very deep exposures greater than 20 feet. The caliche of the Reynosa Cuesta, however, is believed by some (11) to be post-Pliocene, mainly Pleistocene in age (beginning 1.5 to 2.5 million years ago). Caliche near the surface is found in other younger formations. Some of this caliche is attributed to a "case-hardening" effect on the steep

slopes and stream cuts caused by the capillary rise and evaporation of ground water that has a high content of calcium carbonate resulting from previous percolation through calcareous sediments. A difficult field problem, then, is whether massive or extensive caliche in Pleistocene or Holocene sediments always constitutes a Goliad outcrop. The caliche exposed in quarries and stream cuts in the vicinity of Coletto Creek south and east of Raisin is an example.

The Willis Formation overlies the Goliad Formation and forms the parent material for patches of the Straber and Weesatche-Papalote map units and all of the Garcitas and the northwestern part of the Nada-Telferner map units.

The age of the Willis Formation has been described as late Pliocene, Plio-Pleistocene, preglacial (pre-Nebraskan) Pleistocene, or glacial Pleistocene. Recent work on the Citronelle Formation, its correlative in Alabama and Florida, suggests a preglacial, Plio-Pleistocene age; therefore, the Willis may be older than 1.5 to 2.5 million years.

The Willis is fluvial, or possibly alluvial fan in origin. It can be divided into two types of outcrop patterns: south and west of the Guadalupe River, the outcrops are discontinuous and are separated by exposures of the Goliad Formation; and north and east of the river, the Willis is nearly continuous with only sparse, isolated Goliad exposures.

The Willis Formation south and west of the Guadalupe River is within the area of the Weesatche-Papalote and Straber general soil map units. The thicker, more continuous deposits on that side of the river underlie the Silvern and Goldmire soils. The thinner, less continuous deposits make up part of the solum of the Weesatche, Tremona, and Valco soils, whose reddish or brownish colors and siliceous pebbles indicate soil genesis through a thin residual cover of Willis materials. Though patchy here, the Willis Formation is coextensive with the Goliad Formation, and both terminate on the surface along a scarp southeast of and paralleling Farm Road 622. South of the base of the scarp, the younger Pleistocene formations crop out.

Caliche of the Goliad Formation underlies the reddish and gravelly soils of the formation, suggesting that the earliest episodes of caliche formation were pre-Willis and pre-Pleistocene. Later episodes may have followed the partial removal of the Willis cover, assuming it was at one time continuous south and west of the Guadalupe River.

On the northern and eastern sides of the Guadalupe River in Victoria County, the Goliad Formation is largely absent. About the only two easily discernible outcrops are an area of the Valco soils in the vicinity of the Guadalupe bridge crossing Farm Road 447 and an area of the Tremona soils in gravel pits in the vicinity of U.S. Highway 77 and Chicolet Creek at the extreme northern tip of the county.

The Willis Formation on the northern and eastern sides of the Guadalupe River crops out in a continuous band from the Guadalupe River to the northeastern margin of the county. It includes all of the Fordtran and Garcitas map units and the northern parts of the Nada-Telferner general soil map unit. The southeastern limit of the Willis Formation is, on the general soil map, an imaginary line connecting the ends of the elongate patches of the Garcitas map unit. It departs from that shown on the map sheets of the Geologic Atlas of Texas (19, 20). This atlas confines the Willis to the southwestern part of the Garcitas map unit and adjacent parts of the Nada-Telferner unit.

The few undissected, flat areas of the Willis that remain northeast of the river may be slightly reduced and modified original depositional surfaces. The flat areas include: one northeast of the community of Nursery; one between Garcitas Creek and Haynes Flat Creek; and one along the northeast margin of the county, contiguous to Lavaca County. These surfaces slope to the southeast between 10 and 15 feet per mile and are pitted with shallow, rounded undrained depressions occupied by Cieno soils.

The Nada-Telferner map unit includes the older, more dissected Willis and the younger, flatter Lissie Formations. Many small but ubiquitous undrained depressions are occupied by Cieno soils. These depressions also are on the surface of the younger Beaumont Formation.

The undrained depressions are in the flatter parts of the Willis surface and on sloping, dissected parts, where slope is 15 to 25 feet per mile. Those in the northeastern part of the county north of Arenosa Creek and east of U.S. Highway 77 postdate the dissection of the Willis surface.

Several cycles of undrained depression formation are possible: (a) following both the dissection of the Willis surface and the deposition of the younger Lissie; (b) following the deposition of the Willis; and (c) following the dissection of the Willis and the development of rounded slopes. During each cycle, previously formed depressions may have increased in depth and area.

In this part of Texas, the undrained depressions can most likely be ascribed to a "blowout" or wind-excavated origin. Explanations such as piping—subsurface erosion of material followed by surface collapse—or the solution of a soluble substrate like caliche do not seem applicable here. The absence of raised rims, the expected sites of depositions of the removed material, is puzzling. The material, however, is probably dispersed into the solum of the Nada and Telferner soils and makes up the many pimple, or prairie, mounds, of this map unit.

The apparent thickening of the A horizon in the depressions suggests that the Cieno soils are in part cumulative and that the depressions are now filling rather than being excavated.



Some of the depressions have a depressed central part forming a kind of two-storied depression. The central part is seasonally marshy indicating a renewed cycle of deepening and enlargement of some undrained depressions.

By analogy with the depressions on the windward sides of clay dunes found in Gulf Coast counties to the south, the local depressions may be deepened and enlarged during the seasonal desiccation of the marshes, whose clayey surfaces yield sand and silt-sized clay aggregates as well as silt and sand.

These aggregates, upon breaking down into their constituent clay sizes, are unrecognizable as eolian deposits subsequent to their even distribution over the surface or their entrapment by vegetation on pimple mounds.

The deposition of all of the post-Willis geologic units—the Lissie and Beaumont Formations, the Deweyville terraces, and the Holocene Alluvium—was influenced to some extent by glacially induced worldwide sea level changes (4, 21). During the several advances of continental ice sheets that marked the Pleistocene, sea level dropped about 270 to 400 feet below present levels as water was locked up in glacial ice. Coastal streams lowered their channels and flowed across the continental shelves to a more distant Gulf of Mexico. Upon the return of a higher sea level similar to that of the present, the streams resumed their coastwise alluvial plain and deltaic deposition, thus laying down the post-Willis geologic formations. Following their deposition, the formations were progressively tilted gulfward. The older the formation is, the greater the gulfward dip (4). Local tectonic effects such as faulting or doming also have disturbed the surfaces since their deposition.

The Lissie Formation of Pleistocene age immediately overlies the Willis, and like the Willis, crops out in a gulf-parallel band across the county. It makes up the parent material of the southeastern part of the Nada-Telferner map unit, the southern part of the Straber, most of the Telferner-Edna, and all of the Inez unit. A small part of the Telferner-Edna map unit along the Guadalupe River in the northwestern part of the county is an upstream terrace extension of the coastwise Lissie.

The Lissie Formation is less sandy and gravelly than the Willis but more sandy and gravelly than the younger Pleistocene formation, the Beaumont. The use of the term “Lissie” follows that of the latest relevant maps of the Geologic Atlas of Texas (19, 20). On an earlier atlas sheet (18), the Lissie was divided into a younger Montgomery Formation and an older Bentley Formation. The major surface features of the Lissie are the widely distributed undrained depressions and pimple mounds. The Lissie is of interglacial fluvial origin, but the essentially uneroded surface has been sufficiently modified by wind action to remove any indications of its fluvial origin.

The Beaumont Formation is the last of the post-Willis units cropping out in a coastwise band and, like the Lissie, has correlative inland extensions in the form of stream terraces. The area of the Beaumont Formation includes almost all of the Lake Charles-Dacosta, all of the Faddin-Edna, and minor parts of the Telferner-Edna map units.

Most radiocarbon dates for organic materials are greater than 40,000 years. Some have placed the time of Beaumont deposition as Sangamon, the interglacial time of high sea level between the major Illinoian and Wisconsin Stages; others, in a mid-Wisconsin episode of higher sea level. Age estimates have ranged from about 25,000 to 120,000 years.

Most of the Lake Charles-Dacosta and Faddin-Edna map units west of the Guadalupe River are placed in the outcrop area of the Lissie Formation on the relevant map of the Geologic Atlas of Texas (18). The main problem seems to be the excessive tilt and deformation similar to that of the Lissie surface. The surface of the Beaumont here merges imperceptibly, without a topographic discontinuity, with that of the Lissie surface in the adjoining Goliad County. Parts of the Faddin-Edna and Lake Charles-Dacosta map units, namely the Lake Charles and Faddin soils and the Dacosta-Contee complex, are probably uniquely Beaumont in age.

In the more humid counties of the Texas Gulf Coast to the northeast, the Beaumont surface retains a well-defined relict fluvial and deltaic depositional pattern. Though the Beaumont is locally almost certainly deltaic and fluvial in origin, this pattern is lost in Victoria County mainly due to the thorough but subtle eolian reworking of the surface. This eolian activity seems to be responsible for the wide distribution of soils, for example, the Telferner, Edna, Dacosta, Nada, and Cieno soils, on the surface of formations from the Willis to the Beaumont.

It is probable that very clayey soils, for example, the Lake Charles soils, are flood basin or coastal marsh in origin. The Faddin, Contee, and Edna soils may have parent materials of similar origin with eolian additions, or they developed through a thin eolian cover.

Siltier and sandier parent materials are probably of point bar, levee, or delta distributary origin and underlie soils like the Dacosta and Telferner soils.

Small patches of the Lake Charles soils, apparently a key series in identifying the Beaumont Formation, can be traced in the Lake Charles-Dacosta map unit along U.S. Highway 87 as well as in the paralleling elongated patch of the Telferner-Edna map unit. The Lake Charles soils, which are as far north as Nursery, are on terraces along the Holocene flood plain of the Guadalupe River and seem to correlate with the coastwise Beaumont Formation in the southern part of the country. Eolian reworking of the fluvial materials on the terraces, as well as of older materials cut into as strath or erosional

terraces, has been a rather confusing factor in differentiating the terraces.

The Deweyville terraces have been identified mainly along the Guadalupe River south of Nursery, and along the confluences of the San Antonio River and Coleta Creek, and the San Antonio and Guadalupe Rivers (18). The Deweyville Formation occupies a topographic position intermediate between the upland surface of the Beaumont and the bottom lands of the Holocene alluvium. It terminates upslope with meander scars whose radii of curvature are many times greater than those of the present meanders of the Guadalupe River.

The terraces are included in parts of the Meguin-Trinity, the Lake Charles-Dacosta, the Faddin-Edna, and the Telferner-Edna map units.

The Deweyville terraces range in age from about 13,000 to 30,000 years. They span the time of the last glacial drop in sea level (about 18,000 years ago) and part of a later rise in sea level. Thus, some of the terraces may have been deposited, or cut into older materials during both the early falling and later rising of sea level. The large meander scars cut into the uplands on both sides of the Guadalupe River west of Bloomington probably bound Deweyville terraces subsequently drowned by the last rise in sea level and concealed beneath the Holocene alluvium.

The larger meander radius of the Deweyville is best explained as the result of greater stream discharge, which results from the higher rainfall accompanying certain phases of the glacial advance-and-retreat cycle.

A great variety of soils, including the Lake Charles, Telferner, Fordtran, Kuy, Rupley, and Runge soils, are on

the Deweyville terraces. The Lake Charles and the Telferner soils indicate an older surface or a strath origin made by eroding or planing off of older upland materials. The Kuy, Fordtran, Rupley, and Runge soils indicate the wind's reworking of fluvial sands. These soils show a well-defined stabilized dune topography on terraces on the east side of the Guadalupe River between Bloomington and Victoria. The Kuy soils, particularly along the Coleta Creek, formed on rather large eolian accumulations both on terraces and on uplands. The Kuy soils on uplands are made up of eolian material from the Coleta Creek terraces.

The youngest soils of the county, mainly in the Meguin-Trinity, the Rydolph-Trinity, and the Austwell-Aransas map units, developed on Holocene alluvium. The parent materials of the soils are graded to present day sea level.

The parent materials include fluvial materials of, in order of decreasing grain size, channel, point bar, levee, and flood basin origin. The channel deposits, which generally have the coarsest textures, are generally not exposed at the surface long enough to allow soil development. They are either below water, or quickly covered, when a channel is abandoned, by flood basin deposits or lacustrine deposits in oxbow lakes or channel segments.

The extensive sand and gravel deposits in the flood plain of the Guadalupe River are probably not of Holocene age but of the Deweyville age. They probably are the product of higher stream discharges of the Pleistocene age during times of lower sea level and are now buried by Holocene alluvium graded to a higher sea level.



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# glossary

**Aggregate, soil.** Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

**Alluvium.** Material, such as sand, silt, or clay, deposited on land by streams.

**Available water capacity (available moisture capacity).** The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	<i>Inches</i>
Very low.....	0 to 3
Low.....	3 to 6
Moderate.....	6 to 9
High.....	9 to 12
Very high.....	More than 12

**Base saturation.** The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

**Bedding planes.** Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

**Bedrock.** The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

**Bottom land.** The normal flood plain of a stream, subject to flooding.

**Calcareous soil.** A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

**Caliche.** A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds just beneath the solum, or it is exposed at the surface by erosion.

**Calichification.** The production of caliche.

**Cation.** An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

**Cation-exchange capacity.** The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

**Clay.** As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

**Clay film.** A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

**Claypan.** A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

**Climax vegetation.** The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

**Coarse fragments.** If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

**Coarse textured soil.** Sand or loamy sand.

**Complex, soil.** A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

**Concretions.** Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

**Consistence, soil.** The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—  
*Loose.*—Noncoherent when dry or moist; does not hold together in a mass.

*Friable.*—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

**Firm.**—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

**Plastic.**—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a “wire” when rolled between thumb and forefinger.

**Sticky.**—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

**Hard.**—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

**Soft.**—When dry, breaks into powder or individual grains under very slight pressure.

**Cemented.**—Hard; little affected by moistening.

**Contour stripcropping.** Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

**Control section.** The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

**Corrosive.** High risk of corrosion to uncoated steel or deterioration of concrete.

**Cutbanks cave** (in tables). The walls of excavations tend to cave in or slough.

**Decreasers.** The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

**Deferred grazing.** Postponing grazing or arresting grazing for a prescribed period.

**Depth to rock** (in tables). Bedrock is too near the surface for the specified use.

**Diversion (or diversion terrace).** A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

**Drainage class** (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

**Excessively drained.**—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

**Somewhat excessively drained.**—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

**Well drained.**—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

**Moderately well drained.**—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

**Somewhat poorly drained.**—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

**Poorly drained.**—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

**Very poorly drained.**—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

**Drainage, surface.** Runoff, or surface flow of water, from an area.

**Erosion.** The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

**Erosion** (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

**Erosion** (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the

activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

**Excess alkali** (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

**Excess fines** (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

**Excess lime** (in tables). Excess carbonates in the soil that restrict the growth of some plants.

**Excess salts** (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

**Flood plain.** A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

**Foot slope.** The inclined surface at the base of a hill.

**Gilgai.** Commonly a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of Vertisols—clayey soils having a high coefficient of expansion and contraction with changes in moisture content.

**Grassed waterway.** A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

**Gravel.** Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

**Gravelly soil material.** Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

**Gully.** A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

**Horizon, soil.** A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

*O horizon.*—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

*A horizon.*—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

*B horizon.*—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

*C horizon.*—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

*R layer.*—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

**Humus.** The well decomposed, more or less stable part of the organic matter in mineral soils.

**Hydrologic soil groups.** Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

**Increasers.** Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

**Infiltration rate.** The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

**Invaders.** On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface.



**Irrigation.** Application of water to soils to assist in production of crops. Methods of irrigation are—

*Border.*—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

*Basin.*—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

*Controlled flooding.*—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

*Corrugation.*—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

*Drip (or trickle).*—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

*Furrow.*—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

*Sprinkler.*—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

*Subirrigation.*—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

*Wild flooding.*—Water, released at high points, is allowed to flow onto an area without controlled distribution.

**Large stones** (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

**Liquid limit.** The moisture content at which the soil passes from a plastic to a liquid state.

**Loam.** Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

**Low strength.** The soil is not strong enough to support loads.

**Minimum tillage.** Only the tillage essential to crop production and prevention of soil damage.

**Miscellaneous area.** An area that has little or no natural soil and supports little or no vegetation.

**Mottling, soil.** Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few*, *common*, and *many*; size—*fine*, *medium*, and *coarse*; and contrast—*faint*, *distinct*, and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

**Munsell notation.** A designation of color by degrees of the three simple variables—hue, value, and chroma.

For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

**Neutral soil.** A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

**Organic matter.** Plant and animal residue in the soil in various stages of decomposition.

**Parent material.** The unconsolidated organic and mineral material in which soil forms.

**Ped.** An individual natural soil aggregate, such as a granule, a prism, or a block.

**Pedon.** The smallest volume that can be called “a soil.” A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

**Percolation.** The downward movement of water through the soil.

**Percolates slowly** (in tables). The slow movement of water through the soil adversely affecting the specified use.

**Permeability.** The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow.....	less than 0.06 inch
Slow.....	0.06 to 0.20 inch
Moderately slow.....	0.2 to 0.6 inch
Moderate.....	0.6 inch to 2.0 inches
Moderately rapid.....	2.0 to 6.0 inches
Rapid.....	6.0 to 20 inches
Very rapid.....	more than 20 inches

**pH value.** A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

**Plasticity Index.** The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

**Plastic limit.** The moisture content at which a soil changes from semisolid to plastic.

**Plowpan.** A compacted layer formed in the soil directly below the plowed layer.

**Poor outlets** (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

**Profile, soil.** A vertical section of the soil extending through all its horizons and into the parent material.

**Range condition.** The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor, on the basis of how much the present plant community has departed from the potential.

**Reaction, soil.** A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction

because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid.....	Below 4.5
Very strongly acid.....	4.5 to 5.0
Strongly acid.....	5.1 to 5.5
Medium acid.....	5.6 to 6.0
Slightly acid.....	6.1 to 6.5
Neutral.....	6.6 to 7.3
Mildly alkaline.....	7.4 to 7.8
Moderately alkaline.....	7.9 to 8.4
Strongly alkaline.....	8.5 to 9.0
Very strongly alkaline.....	9.1 and higher

**Rock fragments.** Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

**Rooting depth** (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

**Runoff.** The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

**Saline soil.** A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

**Sand.** As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

**Seepage** (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

**Sheet erosion.** The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

**Shrink-swell.** The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

**Silt.** As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

**Slope.** The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

**Slow intake** (in tables). The slow movement of water into the soil.

**Small stones** (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

**Soil.** A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of

climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

**Soil separates.** Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand.....	2.0 to 1.0
Coarse sand.....	1.0 to 0.5
Medium sand.....	0.5 to 0.25
Fine sand.....	0.25 to 0.10
Very fine sand.....	0.10 to 0.05
Silt.....	0.05 to 0.002
Clay.....	less than 0.002

**Solum.** The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

**Strippcropping.** Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

**Structure, soil.** The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

**Subsoil.** Technically, the B horizon; roughly, the part of the solum below plow depth.

**Substratum.** The part of the soil below the solum.

**Subsurface layer.** Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

**Surface layer.** The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

**Taxadjuncts.** Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

**Terrace.** An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built

so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

**Terrace** (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

**Texture, soil.** The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

**Thin layer** (in tables). Otherwise suitable soil material too thin for the specified use.

**Tillth, soil.** The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

**Topsoil.** The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

**Unstable fill** (in tables). Risk of caving or sloughing on banks of fill material.

**Upland** (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

**Weathering.** All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.



# tables

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TABLE 1.--TEMPERATURE AND PRECIPITATION  
[Recorded in the period 1961-78 at Victoria, Texas]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have--		Average number of growing degree days <sup>1</sup>	Average	2 years in 10 will have--		Average number of days with 0.10 inch or more	Average snowfall
				Maximum temperature higher than--	Minimum temperature lower than--			Less than--	More than--		
	<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>Units</u>	<u>In</u>	<u>In</u>	<u>In</u>		<u>In</u>
January----	62.8	42.5	52.6	82	19	195	1.87	.44	2.99	4	.1
February----	66.9	45.1	56.0	84	25	211	1.83	.61	2.83	4	.1
March-----	74.1	52.8	63.4	89	31	426	1.27	.39	1.98	3	.0
April-----	80.7	62.4	71.6	92	41	648	2.67	.72	4.22	3	.0
May-----	85.6	67.9	76.8	95	52	831	4.69	1.33	7.40	5	.0
June-----	90.4	73.0	81.7	97	62	951	5.15	2.19	7.75	5	.0
July-----	93.3	74.9	84.1	100	69	1,057	2.84	.84	4.46	5	.0
August-----	93.5	74.5	84.0	101	67	1,054	3.20	1.44	4.69	5	.0
September--	88.9	71.0	80.0	97	55	900	6.87	3.03	10.14	7	.0
October----	82.8	61.0	71.9	93	41	679	3.12	1.10	4.79	4	.0
November---	73.8	52.5	63.2	88	30	408	2.34	.86	3.57	4	.0
December---	66.7	45.6	56.1	84	24	223	2.16	.64	3.39	4	.0
Yearly:											
Average--	80.0	60.3	70.1	---	---	---	---	---	---	---	---
Extreme--	---	---	---	101	19	---	---	---	---	---	---
Total----	---	---	---	---	---	7,583	38.01	31.00	44.56	53	.2

<sup>1</sup>A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL  
[Recorded in the period 1961-78 at Victoria, Texas]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	February 2	February 28	March 6
2 years in 10 later than--	January 26	February 20	February 27
5 years in 10 later than--	January 12	February 3	February 15
First freezing temperature in fall:			
1 year in 10 earlier than--	December 14	December 6	November 12
2 years in 10 earlier than--	December 23	December 14	November 21
5 years in 10 earlier than--	January 12	December 28	December 8

TABLE 3.--GROWING SEASON  
[Recorded in the period 1961-78 at Victoria, Texas]

Probability	Daily minimum temperature		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	<u>Days</u>	<u>Days</u>	<u>Days</u>
9 years in 10	324	302	276
8 years in 10	336	310	283
5 years in 10	>365	326	296
2 years in 10	>365	343	309
1 year in 10	>365	356	316



TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
Ar	Aransas clay, frequently flooded-----	5,270	0.9
Au	Austwell clay, frequently flooded-----	5,090	0.9
DaA	Dacosta sandy clay loam, 0 to 1 percent slopes-----	43,630	7.6
DaB	Dacosta sandy clay loam, 1 to 3 percent slopes-----	1,340	0.2
DnA	Dacosta-Contee complex, 0 to 1 percent slopes-----	30,220	5.3
DuB	Dacosta-Urban land complex, 0 to 3 percent slopes-----	1,590	0.3
DvC	Dacosta and Telferner soils, 2 to 5 percent slopes, eroded-----	6,890	1.2
Dw	Degola sandy clay loam, frequently flooded-----	3,560	0.6
DxB	Denhawken-Elmendorf complex, 0 to 2 percent slopes-----	1,420	0.2
EdA	Edna fine sandy loam, 0 to 1 percent slopes-----	32,940	5.8
EdB	Edna fine sandy loam, 1 to 3 percent slopes-----	660	0.1
FaA	Faddin fine sandy loam, 0 to 1 percent slopes-----	8,000	1.4
FaB	Faddin fine sandy loam, 1 to 3 percent slopes-----	1,280	0.2
FaC	Faddin fine sandy loam, 3 to 5 percent slopes-----	3,010	0.5
FoB	Fordtran loamy fine sand, 0 to 3 percent slopes-----	11,060	1.9
GaC	Garcitas gravelly loamy fine sand, 1 to 5 percent slopes-----	16,770	2.9
GdC	Goldmire very gravelly loamy fine sand, 1 to 5 percent slopes-----	770	0.1
InB	Inez fine sandy loam, 0 to 2 percent slopes-----	21,280	3.7
KyC	Kuy loamy sand, 0 to 5 percent slopes-----	7,110	1.2
LaA	Lake Charles clay, 0 to 1 percent slopes-----	95,620	16.7
LaB	Lake Charles clay, 1 to 3 percent slopes-----	3,420	0.6
LaD	Lake Charles clay, 5 to 8 percent slopes, eroded-----	7,770	1.4
LcB	Lake Charles-Urban land complex, 0 to 3 percent slopes-----	4,310	0.8
LmB	Leming loamy fine sand, 1 to 3 percent slopes-----	510	0.1
Me	Meguain silty clay, occasionally flooded-----	14,100	2.5
Mf	Meguain silty clay, frequently flooded-----	15,280	2.7
NcA	Nada-Cieno complex, 0 to 1 percent slopes-----	51,850	9.1
PaB	Papalote fine sandy loam, 1 to 3 percent slopes-----	5,020	0.9
Pb	Pits-----	120	0.1
Pd	Pits and Dumps-----	1,820	0.3
Pe	Placedo silty clay loam, frequently flooded-----	1,490	0.3
RaB	Runge fine sandy loam, 0 to 2 percent slopes-----	910	0.2
RaC	Runge fine sandy loam, 2 to 5 percent slopes-----	3,380	0.6
RbC	Rupley fine sand, 1 to 5 percent slopes-----	2,470	0.4
Rd	Rydolph silty clay, occasionally flooded-----	4,920	0.9
Rf	Rydolph silty clay, frequently flooded-----	5,400	0.9
SaB	Sarnosa loam, 1 to 3 percent slopes-----	720	0.1
SkC	Silvern very gravelly loamy sand, 1 to 5 percent slopes-----	340	0.1
Sn	Sinton loam, occasionally flooded-----	3,160	0.6
StB	Straber loamy fine sand, 0 to 2 percent slopes-----	17,690	3.1
StC	Straber loamy fine sand, 2 to 5 percent slopes-----	2,930	0.5
TeA	Telferner fine sandy loam, 0 to 1 percent slopes-----	69,600	12.2
TeB	Telferner fine sandy loam, 1 to 3 percent slopes-----	20,650	3.6
TfB	Telferner-Urban land complex, 0 to 3 percent slopes-----	5,770	1.0
TgC	Tremona gravelly loamy sand, 1 to 3 percent slopes-----	1,110	0.2
To	Trinity clay, occasionally flooded-----	2,830	0.5
Tr	Trinity clay, frequently flooded-----	11,960	2.1
VaD	Valco clay loam, 2 to 8 percent slopes-----	1,350	0.2
WeB	Weesatche sandy clay loam, 1 to 3 percent slopes-----	3,550	0.6
WeC	Weesatche sandy clay loam, 3 to 5 percent slopes-----	3,630	0.6
Za	Zalco fine sand, frequently flooded-----	4,260	0.7
	Water-----	2,330	0.4
	Total-----	572,160	100.0

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Rice	Cotton lint	Grain sorghum	Corn	Flax	Improved bermudagrass
	<u>Bu</u>	<u>Lb</u>	<u>Bu</u>	<u>Bu</u>	<u>Bu</u>	<u>AUM*</u>
Ar----- Aransas	---	---	---	---	---	---
Au----- Austwell	---	---	---	---	---	---
DaA----- Dacosta	100	500	85	75	---	10
DaB----- Dacosta	---	475	80	70	---	8
DnA----- Dacosta-Contee	100	500	83	65	---	10
DuB----- Dacosta-Urban land	---	---	---	---	---	---
DvC----- Dacosta and Telferner	---	---	45	---	---	7
Dw----- Degola	---	---	---	---	---	7
DxB----- Denhawken-Elmendorf	---	345	50	35	---	3.0
EdA----- Edna	120	400	70	60	---	8.0
EdB----- Edna	---	350	65	55	---	8.0
FaA----- Faddin	95	---	70	60	---	8
FaB----- Faddin	---	---	70	60	---	8
FaC----- Faddin	---	---	65	55	---	7
FoB----- Fordtran	---	250	40	---	---	5.5
GaC----- Garcitas	---	---	35	---	---	4.5
GdC----- Goldmire	---	---	---	---	---	2.5
InB----- Inez	85	---	60	50	---	7
KyC----- Kuy	---	---	---	---	---	6
LaA----- Lake Charles	130	500	90	80	---	10
LaB----- Lake Charles	---	450	85	75	---	10

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Rice	Cotton lint	Grain sorghum	Corn	Flax	Improved bermudagrass
	<u>Bu</u>	<u>Lb</u>	<u>Bu</u>	<u>Bu</u>	<u>Bu</u>	<u>AUM*</u>
LaD----- Lake Charles	---	---	---	---	---	5
LcB----- Lake Charles-Urban land	---	---	---	---	---	---
LmB----- Leming	---	350	65	---	---	2.5
Me----- Meguin	---	400	80	75	---	6.5
Mf----- Meguin	---	---	---	---	---	6.5
NcA----- Nada-Cieno	110	---	---	---	---	6
PaB----- Papalote	---	200	45	30	7	5.0
Pb. Pits						
Pd. Pits and Dumps						
Pe----- Placedo	---	---	---	---	---	---
RaB----- Runge	---	250	55	35	12	6.0
RaC----- Runge	---	200	50	25	10	5.5
RbC----- Rupley	---	---	---	---	---	---
Rd----- Rydolph	70	---	80	60	---	8
Rf----- Rydolph	---	---	---	---	---	8
SaB----- Sarnosa	---	300	50	40	10	6.5
SkC----- Silvern	---	---	---	---	---	3.0
Sn----- Sinton	---	350	70	50	---	6.0
StB, StC----- Straber	---	---	40	---	---	6
TeA----- Telferner	80	---	50	---	---	8.0
TeB----- Telferner	---	---	45	---	---	7.0
TfB----- Telferner-Urban land	---	---	---	---	---	---
TgC----- Tremona	---	---	35	---	---	5.0

See footnote at end of table.



TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Rice	Cotton lint	Grain sorghum	Corn	Flax	Improved bermudagrass
	<u>Bu</u>	<u>Lb</u>	<u>Bu</u>	<u>Bu</u>	<u>Bu</u>	<u>AUM*</u>
To----- Trinity	---	450	100	60	---	8.0
Tr----- Trinity	---	---	---	---	---	8.0
VaD----- Valco	---	---	---	---	---	2.0
WeB----- Weesatche	---	350	55	35	---	6.0
WeC----- Weesatche	---	300	50	30	---	5.5
Za----- Zalco	---	---	---	---	---	6.0

\* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)			
		Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		<u>Acres</u>	<u>Acres</u>	<u>Acres</u>	<u>Acres</u>
I	---	---	---	---	---
II	144,950	14,900	128,630	1,420	---
III	328,380	60,690	260,580	7,110	---
IV	27,000	7,770	---	19,230	---
V	40,456	---	40,456	---	---
VI	13,940	---	10,360	3,580	---
VII	1,490	---	1,490	---	---
VIII	---	---	---	---	---

TABLE 7.--RANGELAND PRODUCTIVITY

[Only the soils that support rangeland vegetation suitable for grazing are listed]

Soil name and map symbol	Range site	Potential annual production		
		Favorable Lb/acre	Average Lb/acre	Unfavorable Lb/acre
Ar----- Aransas	Salt Marsh-----	8,000	5,500	2,500
Au----- Austwell	Salty Prairie-----	9,000	7,000	4,500
DaA, DaB----- Dacosta	Blackland-----	8,000	6,000	4,500
DnA*: Dacosta-----	Blackland-----	8,000	6,000	4,500
Contee-----	Blackland-----	8,000	6,000	4,500
DvC*: Dacosta-----	Blackland-----	8,000	6,000	4,500
Telferner-----	Loamy Prairie-----	7,000	5,500	4,000
Dw----- Degola	Loamy Bottomland-----	8,000	7,000	4,500
DxB*: Denhawken-----	Rolling Blackland-----	4,500	4,000	3,000
Elmendorf-----	Rolling Blackland-----	4,500	4,000	3,000
EdA, EdB----- Edna	Claypan Prairie-----	8,000	6,000	5,000
FaA, FaB, FaC----- Faddin	Loamy Prairie-----	8,000	6,500	5,000
FoB----- Fordtran	Sandy Prairie-----	7,000	5,000	3,500
GaC----- Garcitas	Sandy Loam-----	6,500	5,000	3,500
GdC----- Goldmire	Gravelly-----	4,500	3,000	2,000
InB----- Inez	Sandy Loam-----	6,500	5,000	4,000
KyC----- Kuy	Deep Sand-----	4,500	3,200	2,000
LaA, LaB, LaD----- Lake Charles	Blackland-----	9,500	8,000	6,500
LmB----- Leming	Sandy-----	4,500	4,000	2,000
Me, Mf----- Meguin	Loamy Bottomland-----	8,000	6,000	4,500
NcA*: Nada-----	Claypan Prairie-----	7,000	5,500	4,000
Cieno-----	Lowland-----	8,000	6,000	5,000
PaB----- Papalote	Tight Sandy Loam-----	5,000	4,000	2,000

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY--Continued

Soil name and map symbol	Range site	Potential annual production		
		Favorable <u>Lb/acre</u>	Average <u>Lb/acre</u>	Unfavorable <u>Lb/acre</u>
Pe----- Placedo	Salt Marsh-----	19,500	9,000	7,000
RaB, RaC----- Runge	Sandy Loam-----	5,500	4,800	3,000
RbC----- Rupley	Deep Sand-----	4,500	3,200	2,000
Rd, Rf----- Rydolph	Loamy Bottomland-----	7,500	6,000	4,000
SaB----- Sarnosa	Gray Sandy Loam-----	5,000	4,000	3,000
SkC----- Silvern	Gravelly-----	4,500	3,000	2,000
Sn----- Sinton	Loamy Bottomland-----	8,000	6,000	4,500
StB, StC----- Straber	Sandy Loam-----	6,500	5,000	3,500
TeA, TeB----- Telferner	Loamy Prairie-----	7,000	5,000	4,000
TgC----- Tremona	Gravelly-----	4,500	3,000	2,000
To, Tr----- Trinity	Clayey Bottomland-----	7,500	4,000	3,500
VaD----- Valco	Shallow-----	2,500	1,500	1,500
WeB, WeC----- Weesatche	Clay Loam-----	5,800	4,400	3,000
Za----- Zalco	Sandy Bottomland-----	7,000	5,000	3,000

\* See description of the map unit for composition and behavior characteristics of the map unit.



TABLE 8.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe"]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Ar----- Aransas	Severe: flooding, ponding, percs slowly.	Severe: ponding, too clayey, excess salt.	Severe: too clayey, ponding, flooding.	Severe: ponding, too clayey.
Au----- Austwell	Severe: flooding, ponding, percs slowly.	Severe: ponding, too clayey, excess salt.	Severe: too clayey, ponding, flooding.	Severe: ponding, too clayey.
DaA, DaB----- Dacosta	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.
DnA*: Dacosta-----	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.
Contee-----	Severe: wetness, percs slowly, too clayey.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness, percs slowly.	Moderate: wetness.
DuB*: Dacosta-----	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.
Urban land.				
DvC*: Dacosta-----	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.
Telferner-----	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, erodes easily.
Dw----- Degola	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.
DxB*: Denhawken-----	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: too clayey, percs slowly.	Moderate: too clayey.
Elmendorf-----	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight.
EdA, EdB----- Edna	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, erodes easily.
FaA, FaB, FaC----- Faddin	Severe: percs slowly, wetness.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.
FoB----- Fordtran	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: too sandy, wetness.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
GaC----- Garcitas	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.
GdC----- Goldmire	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.
InB----- Inez	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.
KyC----- Kuy	Slight-----	Slight-----	Moderate: slope.	Slight.
LaA, LaB----- Lake Charles	Severe: wetness, percs slowly, too clayey.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness, percs slowly.	Severe: wetness, too clayey.
LaD----- Lake Charles	Severe: wetness, percs slowly, too clayey.	Severe: wetness, too clayey, percs slowly.	Severe: slope, too clayey, wetness.	Severe: wetness, too clayey.
LcB*: Lake Charles-----	Severe: wetness, percs slowly, too clayey.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness, percs slowly.	Severe: wetness, too clayey.
Urban land.				
LmB----- Leming	Slight-----	Slight-----	Moderate: slope.	Slight.
Me----- Meguin	Severe: flooding.	Moderate: too clayey.	Moderate: too clayey, flooding.	Moderate: too clayey.
Mf----- Meguin	Severe: flooding.	Moderate: flooding, too clayey.	Severe: flooding.	Moderate: flooding, too clayey.
NcA*: Nada-----	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, erodes easily.
Cleno-----	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.
PaB----- Papalote	Slight-----	Slight-----	Moderate: slope.	Slight.
Pb*. Pits				
Pd*. Pits and Dumps				
Pe----- Placedo	Severe: flooding, ponding, percs slowly.	Severe: ponding, excess salt.	Severe: ponding, flooding.	Severe: ponding, erodes easily.
RaB----- Runge	Slight-----	Slight-----	Slight-----	Slight.
RaC----- Runge	Slight-----	Slight-----	Moderate: slope.	Slight.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
RbC----- Rupley	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
Rd----- Rydolph	Severe: flooding, too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
Rf----- Rydolph	Severe: flooding, too clayey.	Severe: too clayey.	Severe: too clayey, flooding.	Severe: too clayey.
SaB----- Sarnosa	Slight-----	Slight-----	Moderate: slope.	Slight.
SkC----- Silvern	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.
Sn----- Sinton	Severe: flooding.	Slight-----	Moderate: flooding.	Slight.
StB, StC----- Straber	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope.	Slight.
TeA, TeB----- Telferner	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, erodes easily.
TfB*: Telferner-----	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, erodes easily.
Urban land.				
TgC----- Tremona	Severe: small stones.	Moderate: wetness, percs slowly.	Severe: small stones.	Moderate: wetness.
To----- Trinity	Severe: flooding, wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness.	Severe: wetness, too clayey.
Tr----- Trinity	Severe: flooding, wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness, flooding.	Severe: wetness, too clayey.
VaD----- Valco	Moderate: too clayey.	Severe: cemented pan.	Severe: cemented pan.	Slight.
WeB, WeC----- Weesatche	Slight-----	Slight-----	Moderate: slope.	Slight.
Za----- Zalco	Severe: flooding, too sandy.	Severe: too sandy.	Severe: too sandy, flooding.	Severe: too sandy.

\* See description of the map unit for composition and behavior characteristics of the map unit.



TABLE 9.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hard- wood trees	Conif- erous plants	Shrubs	Wetland plants	Shallow water areas	Open- land wild- life	Wood- land wild- life	Wetland wild- life	Range- land wild- life
Ar----- Aransas	Very poor.	Poor	Poor	---	---	Fair	Poor	Good	Poor	---	Fair	Poor.
Au----- Austwell	Very poor.	Very poor.	Poor	---	---	Poor	Poor	Good	Very poor.	---	Fair	Poor.
DaA, DaB----- Dacosta	Fair	Fair	Fair	---	---	Fair	Fair	Fair	Fair	---	Fair	Fair.
DnA*: Dacosta-----	Fair	Fair	Fair	---	---	Fair	Fair	Fair	Fair	---	Fair	Fair.
Contee-----	Fair	Fair	Fair	---	---	Fair	Fair	Fair	Fair	---	Fair	Fair.
DuB*: Dacosta-----	Fair	Fair	Fair	---	---	Fair	Fair	Fair	Fair	---	Fair	Fair.
Urban land.												
DvC*: Dacosta-----	Fair	Fair	Fair	---	---	Fair	Poor	Poor	Fair	---	Poor	Fair.
Telferner-----	Fair	Fair	Fair	---	---	Good	Fair	Poor	Fair	---	Poor	Fair.
Dw----- Degola	Very poor.	Poor	Fair	---	---	Good	Poor	Very poor.	Poor	---	Very poor.	Fair.
DxB*: Denhawken-----	Good	Good	Fair	Good	---	Good	Poor	Very poor.	Good	---	Very poor.	Fair.
Elmendorf-----	Good	Good	Good	---	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
EdA----- Edna	Fair	Fair	Fair	Fair	Fair	---	Good	Good	Fair	Fair	Good	---
EdB----- Edna	Fair	Fair	Fair	Fair	Fair	---	Good	Fair	Fair	Fair	Fair	---
FaA, FaB, FaC----- Faddin	Fair	Good	Fair	---	---	Fair	Fair	Fair	Fair	---	Fair	Fair.
FoB----- Fordtran	Poor	Fair	Good	---	---	Good	Fair	Fair	Fair	---	Fair	Good.
GaC----- Garcitas	Poor	Poor	Fair	---	---	Good	Poor	Poor	Poor	---	Poor	Fair.
GdC----- Goldmire	Poor	Poor	Fair	---	---	Fair	Poor	Poor	Poor	---	Poor	Fair.
InB----- Inez	Fair	Good	Good	Good	---	---	Fair	Fair	Good	Good	Fair	---
KyC----- Kuy	Fair	Good	Fair	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
LaA----- Lake Charles	Fair	Fair	Fair	Good	Good	---	Fair	Good	Fair	Good	Fair	---
LaB----- Lake Charles	Fair	Fair	Fair	Good	Good	---	Fair	Poor	Fair	Good	Poor	---

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hard- wood trees	Conif- erous plants	Shrubs	Wetland plants	Shallow water areas	Open- land wild- life	Wood- land wild- life	Wetland wild- life	Range- land wild- life
LaD----- Lake Charles	Fair	Fair	Fair	Good	Good	---	Poor	Very poor.	Fair	Good	Poor	---
LcB*: Lake Charles----- Urban land.	Fair	Fair	Fair	Good	Good	---	Fair	Poor	Fair	Good	Poor	---
LmB----- Leming	Fair	Good	Good	---	---	Good	Poor	Poor	Good	---	Poor	Good.
Me----- Meguin	Good	Good	Fair	---	---	Good	Poor	Very poor.	Good	---	Very poor.	Fair.
Mf----- Meguin	Very poor.	Poor	Fair	---	---	Good	Poor	Very poor.	Poor	---	Very poor.	Fair.
NcA*: Nada----- Cieno-----	Poor	Fair	Fair	---	---	Fair	Fair	Fair	Fair	Poor	Fair	Fair.
PaB----- Papalote	Good	Good	Good	---	Poor	Good	Poor	Poor	Good	---	Poor	Good.
Pb*. Pits												
Pd*. Pits and Dumps												
Pe----- Placedo	Very poor.	Very poor.	Very poor.	---	---	Very poor.	Poor	Good	Very poor.	---	Fair	Very poor.
RaB, RaC----- Runge	Good	Good	Good	---	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
RbC----- Rupley	Very poor.	Very poor.	Fair	Fair	---	Good	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Rd----- Rydolph	Fair	Fair	Fair	Fair	---	Fair	Fair	Poor	Fair	---	Fair	Fair.
Rf----- Rydolph	Poor	Fair	Fair	Fair	---	Fair	Fair	Poor	Fair	---	Fair	Fair.
SaB----- Sarnosa	Good	Good	Good	---	---	Good	Very poor.	Very poor.	Good	---	Very poor.	Good.
SkC----- Silvern	Poor	Poor	Poor	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
Sn----- Sinton	Good	Good	Good	---	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
StB, StC----- Straber	Fair	Good	Good	---	---	Good	Poor	Poor	Good	---	Poor	Good.
TeA----- Telferner	Fair	Fair	Fair	---	---	Good	Fair	Fair	Fair	---	Fair	Fair.
TeB----- Telferner	Fair	Fair	Fair	---	---	Good	Fair	Poor	Fair	---	Poor	Fair.
TfB*: Telferner----- Urban land.	Fair	Fair	Fair	---	---	Good	Fair	Poor	Fair	---	Poor	Fair.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hard- wood trees	Conif- erous plants	Shrubs	Wetland plants	Shallow water areas	Open- land wild- life	Wood- land wild- life	Wetland wild- life	Range- land wild- life
TgC----- Tremona	Poor	Poor	Fair	---	---	Good	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
To----- Trinity	Fair	Good	Fair	Good	---	---	Poor	Fair	Fair	Good	Poor	---
Tr----- Trinity	Poor	Fair	Fair	Good	---	---	Poor	Fair	Fair	Fair	Poor	---
VaD----- Valco	Poor	Poor	Fair	---	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.
WeB----- Weesatche	Good	Good	Fair	---	---	Fair	Very poor.	Very poor.	Good	---	Very poor.	Fair.
WeC----- Weesatche	Fair	Good	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Za----- Zalco	Poor	Fair	Fair	---	---	Good	Very poor.	Very poor.	Fair	---	Very poor.	Fair.

\* See description of the map unit for composition and behavior characteristics of the map unit.



TABLE 10.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe"]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Ar----- Aransas	Severe: ponding.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: low strength, ponding, flooding.	Severe: excess salt, ponding, droughty.
Au----- Austwell	Severe: ponding.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: low strength, ponding, flooding.	Severe: excess salt, ponding, droughty.
DaA, DaB----- Dacosta	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
DnA*: Dacosta-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
Contee-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness, too clayey.
DuB*: Dacosta-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
Urban land.						
DvC*: Dacosta-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
Telferner-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
Dw----- Degola	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
DxB*: Denhawken-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
Elmendorf-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
EdA, EdB----- Edna	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
FaA, FaB, FaC----- Faddin	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: wetness.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
FoB----- Fordtran	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
GaC----- Garcitas	Severe: cutbanks cave, wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength.	Severe: small stones, droughty.
GdC----- Goldmire	Slight-----	Slight-----	Slight-----	Slight-----	Slight-----	Severe: small stones.
InB----- Inez	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
KyC----- Kuy	Severe: cutbanks cave.	Slight-----	Moderate: wetness.	Slight-----	Slight-----	Moderate: droughty.
LaA, LaB, LaD----- Lake Charles	Severe: cutbanks cave, wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness, too clayey.
LcB*: Lake Charles-----	Severe: cutbanks cave, wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness, too clayey.
Urban land.						
LmB----- Leming	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Moderate: droughty.
Me, Mf----- Meguin	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: too clayey, flooding.
NcA*: Nada-----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness.	Severe: wetness.
Cieno-----	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding.	Severe: ponding.
PaB----- Papalote	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Pb*. Pits						
Pd*. Pits and Dumps						
Pe----- Placedo	Severe: ponding.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: low strength, ponding, flooding.	Severe: excess salt, ponding, droughty.
RaB, RaC----- Runge	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.	Slight.
RbC----- Rupley	Moderate: wetness.	Slight-----	Moderate: wetness.	Slight-----	Slight-----	Severe: droughty.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Rd----- Rydolph	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, flooding.	Severe: too clayey.
Rf----- Rydolph	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, flooding.	Severe: flooding, too clayey.
SaB----- Sarnosa	Slight-----	Slight-----	Slight-----	Slight-----	Slight-----	Slight.
SkC----- Silvern	Severe: cutbanks cave.	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.	Severe: small stones, droughty.
Sn----- Sinton	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Moderate: flooding.
StB, StC----- Straber	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
TeA, TeB----- Telferner	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
TfB*: Telferner-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
Urban land.						
TgC----- Tremona	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness, shrink-swell.	Moderate: wetness.	Moderate: wetness.	Severe: droughty.
To----- Trinity	Severe: cutbanks cave, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, wetness, flooding.	Severe: wetness, too clayey.
Tr----- Trinity	Severe: cutbanks cave, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding, too clayey.
VaD----- Valco	Moderate: cemented pan.	Moderate: cemented pan.	Moderate: cemented pan.	Moderate: cemented pan, slope.	Moderate: cemented pan.	Severe: thin layer.
WeB----- Weesatche	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.	Slight.
WeC----- Weesatche	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, shrink-swell.	Slight.
Za----- Zalco	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.

\* See description of the map unit for composition and behavior characteristics of the map unit.



TABLE 11.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ar----- Aransas	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding, too clayey.	Severe: flooding, ponding.	Poor: too clayey, hard to pack, ponding.
Au----- Austwell	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding, too clayey.	Severe: flooding, ponding.	Poor: too clayey, hard to pack, ponding.
DaA, DaB----- Dacosta	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
DnA*: Dacosta-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Contee-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
DuB*: Dacosta-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Urban land.					
DvC*: Dacosta-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Telferner-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Dw----- Degola	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Fair: too clayey.
DxB*: Denhawken-----	Severe: percs slowly.	Slight-----	Severe: too clayey.	Slight-----	Poor: too clayey, hard to pack.
Elmendorf-----	Severe: percs slowly.	Slight-----	Severe: too clayey.	Slight-----	Poor: too clayey, hard to pack.
EdA----- Edna	Severe: wetness, percs slowly.	Slight-----	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
EdB----- Edna	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
FaA----- Faddin	Severe: wetness, percs slowly.	Slight-----	Severe: wetness, too clayey.	Severe: wetness.	Poor: wetness, too clayey, hard to pack.
FaB, FaC----- Faddin	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: wetness, too clayey, hard to pack.
FoB----- Fordtran	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: wetness, too clayey.	Severe: seepage, wetness.	Poor: too clayey, hard to pack, wetness.
GaC----- Garcitas	Severe: wetness, percs slowly.	Severe: seepage.	Severe: wetness, too clayey.	Severe: seepage.	Poor: too clayey, hard to pack, small stones.
GdC----- Goldmire	Severe: percs slowly.	Moderate: slope.	Slight-----	Slight-----	Poor: small stones.
InB----- Inez	Severe: wetness, percs slowly.	Slight-----	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
KyC----- Kuy	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Fair: too sandy, wetness.
LaA----- Lake Charles	Severe: wetness, percs slowly.	Slight-----	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
LaB, LaD----- Lake Charles	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
LcB*: Lake Charles-----	Severe: wetness, percs slowly.	Slight-----	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Urban land.					
LmB----- Leming	Severe: percs slowly.	Severe: seepage.	Severe: too clayey.	Severe: seepage.	Poor: too clayey, hard to pack.
Me, Mf----- Meguin	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Fair: too clayey.
NcA*: Nada-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
NcA*: Cleno-----	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
PaB----- Papalote	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----	Poor: too clayey, hard to pack.
Pb*. Pits					
Pd*. Pits and Dumps					
Pe----- Placedo	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding, too clayey.	Severe: flooding, ponding.	Poor: too clayey, hard to pack, ponding.
RaB, RaC----- Runge	Moderate: percs slowly.	Severe: seepage.	Moderate: too clayey.	Severe: seepage.	Fair: too clayey.
RbC----- Rupley	Severe: poor filter.	Severe: seepage.	Severe: seepage, wetness.	Severe: seepage.	Poor: seepage.
Rd, Rf----- Rydolph	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
SaB----- Sarnosa	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Slight-----	Good.
SkC----- Silvern	Severe: poor filter.	Severe: seepage.	Moderate: too sandy, large stones.	Severe: seepage.	Poor: seepage, small stones.
Sn----- Sinton	Severe: flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Severe: flooding, seepage.	Good.
StB, StC----- Straber	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----	Poor: too clayey, hard to pack.
TeA, TeB----- Telferner	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
TfB*: Telferner-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Urban land.					
TgC----- Tremona	Severe: wetness, percs slowly, poor filter.	Severe: seepage.	Severe: wetness, too clayey.	Severe: seepage.	Poor: too clayey, hard to pack.
To, Tr----- Trinity	Severe: flooding, wetness, percs slowly.	Slight-----	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.

See footnote at end of table.



TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
VaD----- Valco	Severe: cemented pan.	Severe: cemented pan, seepage.	Moderate: cemented pan.	Slight-----	Poor: thin layer.
WeB, WeC----- Weesatche	Moderate: percs slowly..	Moderate: seepage, slope.	Slight-----	Slight-----	Good.
Za----- Zalco	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy.

\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable"]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Ar----- Aransas	Poor: wetness, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, wetness.
Au----- Austwell	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, wetness.
DaA, DaB----- Dacosta	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
DnA*: Dacosta-----	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
Contee-----	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
DuB*: Dacosta-----	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
Urban land.				
DvC*: Dacosta-----	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
Telferner-----	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
Dw----- Degola	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
DxB*: Denhawken-----	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Elmendorf-----	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
EdA, EdB----- Edna	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, too clayey.
FaA, FaB, FaC----- Faddin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
FoB----- Fordtran	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
GaC----- Garcitas	Fair: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
GdC----- Goldmire	Good-----	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
InB----- Inez	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
KyC----- Kuy	Good-----	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
LaA, LaB, LaD----- Lake Charles	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
LcB*: Lake Charles-----	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Urban land.				
LmB----- Leming	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
Me, Mf----- Meguin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
NcA*: Nada-----	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
Cleno-----	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
PaB----- Papalote	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Pb*. Pits				
Pd*. Pits and Dumps				
Pe----- Placedo	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, wetness.
RaB, RaC----- Runge	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
RbC----- Rupley	Good-----	Probable-----	Improbable: too sandy.	Poor: too sandy.

See footnote at end of table.



TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Rd, Rf----- Rydolph	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
SaB----- Sarnosa	Good-----	Improbable: excess fines.	Improbable: excess fines.	Good.
SkC----- Silvern	Fair: large stones.	Probable-----	Probable-----	Poor: small stones, area reclaim.
Sn----- Sinton	Moderate: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
StB, StC----- Straber	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
TeA, TeB----- Telferner	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
TfB*: Telferner-----	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
Urban land.				
TgC----- Tremona	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
To, Tr----- Trinity	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
VaD----- Valco	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
WeB, WeC----- Weesatche	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Za----- Zalco	Good-----	Probable-----	Improbable: too sandy.	Poor: too sandy.

\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe"]

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Ar----- Aransas	Slight-----	Severe: hard to pack, ponding.	Ponding, percs slowly, flooding.	Ponding, droughty, slow intake.	Ponding, percs slowly.	Wetness, excess salt, droughty.
Au----- Austwell	Slight-----	Severe: ponding, excess salt.	Ponding, percs slowly, flooding.	Ponding, droughty, slow intake.	Ponding, percs slowly.	Wetness, excess salt, droughty.
DaA, DaB----- Dacosta	Slight-----	Severe: wetness.	Percs slowly---	Wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
DnA*: Dacosta-----	Slight-----	Severe: wetness.	Percs slowly---	Wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
Contee-----	Slight-----	Severe: wetness.	Percs slowly---	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
DuB*: Dacosta-----	Slight-----	Severe: wetness.	Percs slowly---	Wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
Urban land.						
DvC*: Dacosta-----	Moderate: slope.	Severe: wetness.	Percs slowly, slope.	Wetness, percs slowly, slope.	Wetness, percs slowly.	Wetness, percs slowly.
Telferner-----	Slight-----	Severe: wetness.	Percs slowly, slope.	Wetness-----	Erodes easily, wetness.	Wetness, erodes easily, percs slowly.
Dw----- Degola	Moderate: seepage.	Moderate: piping.	Deep to water	Flooding-----	Favorable-----	Favorable.
DxB*: Denhawken-----	Slight-----	Severe: hard to pack.	Deep to water	Slow intake, percs slowly.	Percs slowly---	Percs slowly.
Elmendorf-----	Slight-----	Moderate: hard to pack.	Deep to water	Percs slowly---	Percs slowly---	Percs slowly.
EdA, EdB----- Edna	Slight-----	Severe: hard to pack, wetness.	Percs slowly---	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
FaA, FaB----- Faddin	Slight-----	Severe: hard to pack.	Percs slowly---	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
FaC----- Faddin	Slight-----	Severe: hard to pack.	Percs slowly, slope.	Wetness, percs slowly, slope.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
FoB----- Fordtran	Slight-----	Moderate: wetness, hard to pack.	Percs slowly---	Wetness, fast intake.	Wetness, percs slowly.	Wetness, percs slowly.
GaC----- Garcitas	Slight-----	Moderate: hard to pack, wetness.	Percs slowly, slope.	Wetness, droughty, fast intake.	Wetness, percs slowly.	Droughty, percs slowly.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
GdC----- Goldmire	Moderate: slope.	Slight-----	Deep to water	Droughty, fast intake, slope.	Favorable-----	Droughty.
InB----- Inez	Slight-----	Severe: hard to pack, wetness.	Percs slowly---	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
KyC----- Kuy	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake.	Too sandy-----	Droughty.
LaA, LaB, LaD----- Lake Charles	Slight-----	Severe: hard to pack, wetness.	Percs slowly---	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
LcB*: Lake Charles-----	Slight-----	Severe: hard to pack, wetness.	Percs slowly---	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
Urban land.						
LmB----- Leming	Severe: seepage.	Moderate: hard to pack.	Deep to water	Droughty, fast intake, percs slowly.	Percs slowly---	Droughty, percs slowly.
Me, Mf----- Meguin	Moderate: seepage.	Moderate: piping.	Deep to water	Slow intake, flooding.	Favorable-----	Favorable.
NcA*: Nada-----	Slight-----	Severe: wetness.	Percs slowly---	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Cieno-----	Slight-----	Severe: ponding.	Ponding, percs slowly.	Ponding, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.
PaB----- Papalote	Slight-----	Moderate: hard to pack.	Deep to water	Percs slowly---	Percs slowly---	Percs slowly.
Pb*. Pits						
Pd*. Pits and Dumps						
Pe----- Placedo	Slight-----	Severe: hard to pack, ponding, excess salt.	Ponding, percs slowly, flooding.	Ponding, droughty.	Ponding, percs slowly.	Wetness, excess salt.
RaB----- Runge	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable-----	Favorable-----	Favorable.
RaC----- Runge	Moderate: seepage.	Moderate: piping.	Deep to water	Slope-----	Favorable-----	Favorable.
RbC----- Rupley	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, slope.	Favorable-----	Droughty.
Rd, Rf----- Rydolph	Slight-----	Moderate: hard to pack, wetness.	Percs slowly, flooding.	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Percs slowly.
SaB----- Sarnosa	Moderate: seepage.	Slight-----	Deep to water	Favorable-----	Favorable-----	Favorable.

See footnote at end of table.



TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
SkC----- Silvern	Severe: seepage.	Severe: seepage.	Deep to water	Large stones, droughty, fast intake.	Large stones, too sandy.	Large stones, droughty.
Sn----- Sinton	Severe: seepage.	Moderate: compressible, piping.	Flooding-----	Flooding-----	Favorable-----	Favorable.
StB, StC----- Straber	Slight-----	Moderate: hard to pack.	Deep to water	Percs slowly, fast intake.	Percs slowly---	Percs slowly.
TeA, TeB----- Telferner	Slight-----	Severe: wetness.	Percs slowly---	Wetness-----	Erodes easily, wetness.	Wetness, erodes easily, percs slowly.
TfB*: Telferner-----	Slight-----	Severe: wetness.	Percs slowly---	Wetness-----	Erodes easily, wetness.	Wetness, erodes easily, percs slowly.
Urban land.						
TgC----- Tremona	Slight-----	Moderate: hard to pack, wetness.	Percs slowly---	Wetness, droughty, fast intake.	Wetness, percs slowly.	Droughty, percs slowly.
To, Tr----- Trinity	Slight-----	Severe: hard to pack, wetness.	Percs slowly, flooding.	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
VaD----- Valco	Severe: cemented pan, seepage.	Severe: thin layer.	Cemented pan, slope.	Cemented pan, slope.	Cemented pan---	Cemented pan.
WeB----- Weesatche	Moderate: seepage.	Slight-----	Deep to water	Favorable-----	Favorable-----	Favorable.
WeC----- Weesatche	Moderate: seepage.	Slight-----	Deep to water	Slope-----	Favorable-----	Favorable.
Za----- Zalco	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, flooding.	Too sandy-----	Droughty.

\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--ENGINEERING INDEX PROPERTIES

[The symbol &lt; means less than; &gt; means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit Pct	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
Ar----- Aransas	0-60	Clay-----	CH	A-7-6	0	100	95-100	95-100	75-95	51-75	30-50
Au----- Austwell	0-18	Clay-----	CH	A-7-6	0	100	98-100	85-100	80-95	51-65	30-40
	18-42	Clay-----	CH	A-7-6	0	100	98-100	85-100	80-95	51-65	30-40
	42-60	Silty clay loam--	CL, CH	A-7-6	0	100	98-100	85-100	80-95	45-60	25-40
DaA----- Dacosta	0-12	Sandy clay loam--	CL	A-6, A-7	0	95-100	90-100	90-100	65-80	35-45	18-25
	12-40	Clay, sandy clay	CH, CL	A-7-6	0	95-100	90-100	90-100	70-95	48-65	30-40
	40-80	Sandy clay loam, sandy clay.	CL, CH	A-7-6	0	95-100	90-100	85-100	65-80	45-60	25-40
DaB----- Dacosta	0-9	Sandy clay loam--	CL	A-6, A-7	0	95-100	90-100	90-100	65-80	35-45	18-25
	9-41	Clay-----	CH, CL	A-7-6	0	95-100	90-100	90-100	70-95	48-65	30-40
	41-80	Clay loam-----	CL, CH	A-7-6	0	95-100	90-100	85-95	65-80	45-60	25-40
DnA*: Dacosta-----	0-11	Clay loam-----	CL	A-6, A-7	0	95-100	90-100	90-100	65-80	35-45	18-25
	11-50	Clay-----	CH, CL	A-7-6	0	95-100	90-100	90-100	70-95	48-65	30-40
	50-80	Clay-----	CL, CH	A-7-6	0	95-100	90-100	85-95	65-80	45-60	25-40
Contee-----	0-9	Clay loam-----	CL, CH	A-7-6	0	95-100	90-100	85-100	75-95	45-55	25-35
	9-56	Clay-----	CH	A-7-6	0	90-100	85-100	80-100	70-95	51-65	30-40
	56-80	Clay-----	CL, CH	A-7-6	0	90-100	85-100	80-100	70-95	45-60	25-35
DuB*: Dacosta-----	0-12	Sandy clay loam--	CL	A-6, A-7	0	95-100	90-100	90-100	65-80	35-45	18-25
	12-40	Clay, sandy clay	CH, CL	A-7-6	0	95-100	90-100	90-100	70-95	48-65	30-40
	40-80	Sandy clay loam, sandy clay.	CL, CH	A-7-6	0	95-100	90-100	85-95	65-80	45-60	25-40
Urban land.											
DvC*: Dacosta-----	0-2	Sandy clay loam--	CL	A-6, A-7	0	95-100	90-100	90-100	65-80	35-45	18-25
	2-80	Clay-----	CH, CL	A-7-6	0	95-100	90-100	90-100	70-95	48-65	30-40
Telferner-----	0-16	Fine sandy loam--	CL, SC, CL-ML, SM-SC	A-4	0	98-100	98-100	80-100	40-60	20-30	5-10
	16-80	Sandy clay, clay	CH	A-7-6	0	98-100	98-100	90-100	55-85	51-65	30-40
Dw----- Degola	0-25	Sandy clay loam--	CL, SC	A-6	0	95-100	95-100	80-100	40-80	28-40	11-18
	25-60	Sandy clay loam--	CL, SC	A-6	0	95-100	95-100	80-100	40-80	28-40	11-18
DxB*: Denhawken-----	0-5	Clay loam-----	CL, CH	A-6, A-7	0-2	95-100	90-100	90-100	60-90	35-55	16-33
	5-73	Clay-----	CH, CL	A-7	0-2	95-100	90-100	85-100	70-95	48-68	25-43
Elmendorf-----	0-11	Clay loam-----	CL	A-6, A-7	0-2	95-100	90-100	90-100	65-90	30-50	15-28
	11-80	Clay-----	CH, CL	A-7	0-2	95-100	90-100	90-100	70-95	45-65	25-40
EdA----- Edna	0-8	Fine sandy loam--	CL-ML, SM-SC, CL, SC	A-4, A-6	0	100	100	90-100	45-75	23-40	6-20
	8-18	Clay-----	CH	A-7	0	100	98-100	90-100	60-80	50-72	28-46
	18-41	Clay, clay loam	CL, CH	A-7	0	100	98-100	80-100	70-80	41-60	20-36
	41-80	Clay loam, sandy clay loam.	CL, CH	A-7, A-6	0	98-100	98-100	80-100	55-80	30-60	13-35

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches Pct	Percentage passing sieve number--				Liquid limit Pct	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
EdB----- Edna	0-9	Fine sandy loam--	CL-ML, SM-SC, CL, SC	A-4, A-6	0	100	100	90-100	45-75	23-40	6-20
	9-29	Clay loam-----	CH	A-7	0	100	98-100	90-100	60-80	50-72	28-46
	29-49	Clay loam-----	CL, CH	A-7	0	100	98-100	80-100	70-80	41-60	20-36
	49-80	Clay-----	CL, CH	A-7, A-6	0	98-100	98-100	80-100	55-80	30-60	13-35
FaA----- Faddin	0-16	Fine sandy loam--	SM, SM-SC	A-4	0	98-100	98-100	90-100	36-49	<25	NP-7
	16-46	Sandy clay, clay	CL, CH	A-7-6	0	100	98-100	90-100	55-75	41-66	25-45
	46-80	Sandy clay-----	CL	A-7-6	0-1	95-100	90-100	85-100	51-70	41-49	25-33
FaB----- Faddin	0-16	Fine sandy loam--	SM, SM-SC	A-4	0	98-100	98-100	90-100	36-49	<25	NP-7
	16-39	Clay-----	CL, CH	A-7-6	0	100	98-100	90-100	55-75	41-66	25-45
	39-60	Clay loam-----	CL	A-7-6	0-1	95-100	90-100	85-100	51-70	41-49	25-33
FaC----- Faddin	0-14	Fine sandy loam--	SM, SM-SC	A-4	0	98-100	98-100	90-100	36-49	<25	NP-7
	14-44	Sandy clay, clay	CL, CH	A-7-6	0	100	98-100	90-100	55-75	41-66	25-45
	44-60	Clay loam-----	CL	A-7-6	0-1	95-100	90-100	85-100	51-70	41-49	25-33
FoB----- Fordtran	0-37	Loamy fine sand--	SM, SM-SC	A-2-4, A-1-B	0	80-100	80-100	40-95	13-30	<25	NP-6
	37-70	Sandy clay, clay, clay loam, sandy clay loam.	CH, CL	A-7	0	90-100	90-100	80-100	51-90	41-55	20-30
GaC----- Garcitas	0-21	Gravelly loamy fine sand.	SM, SP-SM, GP-GM, GM	A-1 A-2-4	0-5	25-85	15-80	12-65	5-25	<20	NP-4
	21-29	Gravelly clay, gravelly sandy clay.	SC, CH, GC	A-7-6	0-5	65-90	50-80	50-75	45-70	51-70	29-46
	29-80	Clay loam, sandy clay loam, clay.	SC, CL, CH	A-6, A-7	0	90-100	78-100	60-95	36-75	35-55	17-35
GdC----- Goldmire	0-3	Very gravelly loamy fine sand.	GP, GM, SP, SM	A-1	0-15	20-55	18-50	9-40	2-15	<25	NP-3
	3-49	Very gravelly sandy clay loam, very gravelly clay loam.	GC, SC, SP-SC, GP-GC	A-2-7	0-5	20-55	18-50	15-45	6-30	43-60	25-42
	49-80	Gravelly sandy clay loam.	GC, SC	A-2-7, A-7	0-5	40-80	35-75	25-70	13-40	43-60	25-42
InB----- Inez	0-14	Fine sandy loam--	SM, SM-SC	A-2-4, A-4	0	98-100	98-100	90-100	25-49	<25	NP-7
	14-49	Clay, sandy clay	CL, CH	A-7-6	0	98-100	98-100	90-100	55-75	41-66	25-45
	49-80	Sandy clay, clay loam, sandy clay loam.	CL, CH	A-6, A-7-6	0	98-100	98-100	90-100	55-75	36-55	25-40
KyC----- Kuy	0-51	Loamy sand-----	SM, SM-SC	A-2-4	0	100	95-100	70-100	15-35	<25	NP-7
	51-80	Sandy clay loam, clay loam.	SC, CL, SM-SC	A-4, A-6	0	100	90-100	75-100	36-75	21-40	7-20
LaA----- Lake Charles	0-23	Clay-----	CH	A-7-6	0	100	99-100	80-100	75-100	64-80	40-55
	23-54	Clay-----	CH	A-7-6	0	98-100	98-100	80-100	75-100	54-90	37-60
	54-80	Clay-----	CH	A-7-6	0	94-100	94-100	80-95	75-95	51-90	30-60
LaB----- Lake Charles	0-47	Clay-----	CH	A-7-6	0	100	99-100	80-100	75-100	64-80	40-55
	47-56	Clay-----	CH	A-7-6	0	98-100	98-100	80-100	75-100	54-90	37-60
	56-80	Clay-----	CH	A-7-6	0	94-100	94-100	80-95	75-95	51-90	30-60
LaD----- Lake Charles	0-24	Clay-----	CH	A-7-6	0	100	99-100	80-100	75-100	64-80	40-55
	24-60	Clay-----	CH	A-7-6	0	98-100	98-100	80-100	75-100	54-90	37-60
	60-80	Clay-----	CH	A-7-6	0	94-100	94-100	80-95	75-95	51-90	30-60

See footnote at end of table.



TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches Pct	Percentage passing sieve number--				Liquid limit Pct	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	<u>In</u>										
LcB*: Lake Charles----	0-23	Clay-----	CH	A-7-6	0	100	99-100	80-100	75-100	64-80	40-55
	23-54	Clay-----	CH	A-7-6	0	98-100	98-100	80-100	75-100	54-90	37-60
	54-80	Clay-----	CH	A-7-6	0	94-100	94-100	80-95	75-95	51-90	30-60
Urban land.											
LmB----- Leming	0-29	Loamy fine sand--	SM-SC, SM	A-2-4	0	95-100	95-100	50-75	20-35	<30	NP-7
	29-60	Sandy clay, clay, clay loam.	CL, SC, CH	A-7-6	0	95-100	95-100	80-95	45-60	41-55	20-30
	60-80	Sandy clay loam, sandy clay.	CL, SC	A-6, A-7-6	0-10	95-100	90-100	80-95	40-60	30-45	11-25
Me----- Meguin	0-13	Silty clay-----	CH, CL	A-7-6	0	100	100	90-100	80-95	48-60	25-35
	13-80	Silty clay loam, clay loam.	CL	A-7-6, A-6	0	95-100	90-100	90-100	75-95	30-48	11-25
Mf----- Meguin	0-10	Silty clay-----	CH, CL	A-7-6	0	100	100	90-100	80-95	48-60	25-35
	10-60	Silty clay loam, clay loam.	CL	A-7-6, A-6	0	95-100	90-100	90-100	75-95	30-48	11-25
NcA*: Nada-----	0-8	Sandy loam-----	SM, SM-SC	A-4	0	95-100	95-100	80-100	36-49	<25	NP-7
	8-25	Sandy clay loam, clay loam, sandy clay.	CL	A-6, A-7-6	0	98-100	95-100	90-100	51-75	30-44	19-32
	25-80	Sandy clay loam, clay loam.	CL, SC	A-6	0	95-100	95-100	85-100	40-70	28-40	15-25
Cieno-----	0-6	Sandy clay loam--	CL	A-6	0	98-100	95-100	85-100	51-70	28-40	15-25
	6-51	Sandy clay loam, clay loam, sandy clay.	CL	A-6, A-7-6	0	98-100	95-100	90-100	60-85	32-42	20-30
	51-80	Sandy clay loam, clay loam.	CL, SC	A-6	0	98-100	95-100	85-100	40-70	28-40	15-25
PaB----- Papalote	0-16	Fine sandy loam--	SM, SM-SC, SC	A-2-4, A-4	0	95-100	95-100	90-100	25-50	<25	NP-8
	16-45	Sandy clay, clay	CL, SC, CH	A-7-6	0	95-100	90-100	85-100	43-70	41-60	21-36
	45-80	Sandy clay loam, clay loam.	CL, SC	A-6, A-7-6	0	95-100	80-100	75-96	36-70	35-49	18-31
Pb*. Pits											
Pd*. Pits and Dumps											
Pe----- Placedo	0-12	Silty clay loam--	CL, CH	A-7-6	0	100	98-100	95-100	85-100	45-70	25-45
	12-36	Clay, silty clay, silty clay loam.	CH, CL	A-7-6	0	100	98-100	95-100	85-100	45-70	25-45
	36-60	Stratified clay to fine sandy loam.	CL, CH	A-6, A-7-6	0	100	98-100	95-100	75-100	35-60	20-40
RaB----- Runge	0-9	Fine sandy loam--	SM, SM-SC	A-2, A-4	0	100	95-100	95-100	25-45	<25	NP-7
	9-60	Sandy clay loam, clay loam.	SC, CL	A-6, A-7-6	0	100	95-100	85-100	45-65	30-44	11-22
RaC----- Runge	0-12	Fine sandy loam--	SM, SM-SC	A-2, A-4	0	100	95-100	95-100	25-45	<25	NP-7
	12-60	Sandy clay loam, clay loam.	SC, CL	A-6, A-7-6	0	100	95-100	85-100	45-65	30-44	11-22
RbC----- Rupley	0-20	Fine sand-----	SP-SM, SM	A-2-4, A-3	0	100	100	75-100	5-25	<25	NP-3
	20-80	Fine sand, loamy fine sand.	SP-SM, SM	A-2-4, A-3	0	100	100	75-100	5-25	<25	NP-3

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit Pct	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	<u>In</u>				<u>Pct</u>						
Rd----- Rydolph	0-9 9-80	Silty clay----- Silty clay loam, silt loam, loam.	CH CL, CH	A-7-6 A-6, A-7-6	0 0	100 98-100	98-100 95-100	90-100 90-100	85-98 75-95	51-65 38-62	33-44 22-40
Rf----- Rydolph	0-8 8-60	Silty clay----- Silty clay loam--	CH CL, CH	A-7-6 A-6, A-7-6	0 0	100 98-100	98-100 95-100	90-100 90-100	85-98 75-95	51-65 38-62	33-44 22-40
SaB----- Sarnosa	0-20 20-70	Loam----- Sandy clay loam, loam.	SC SC, SM-SC	A-2-6, A-2-7, A-6, A-7 A-2-4, A-4	0 0	95-100 80-100	95-100 80-100	70-90 60-85	20-45 20-40	30-45 20-30	11-25 4-10
SkC----- Silvern	0-46 46-70	Very gravelly loamy sand. Very gravelly sandy clay loam, very gravelly sandy loam.	GP-GM, GP GC, SC, GP-GC, SP-SC	A-1 A-2-6, A-2-7	5-30 5-25	20-45 25-60	15-40 20-55	7-25 15-35	2-11 8-30	<20 28-50	NP-5 11-33
Sn----- Sinton	0-24 24-80	Loam----- Stratified loamy fine sand to sandy clay loam.	CL SM, SC, ML, CL	A-4, A-6 A-2-4, A-2-6, A-4, A-6	0 0	100 100	95-100 90-100	85-100 50-100	50-80 20-52	27-40 <30	9-20 NP-14
StB----- Straber	0-13 13-46 46-65	Loamy fine sand-- Clay----- Sandy clay-----	SM, SM-SC CL, CH, SC CL, CH, SC	A-2 A-7 A-7	0-2 0-2 0-2	85-100 85-100 85-100	80-100 80-100 80-100	50-75 70-100 70-100	15-35 45-65 45-85	<25 45-60 45-60	NP-6 25-40 25-40
StC----- Straber	0-12 12-25 25-53 53-80	Loamy fine sand-- Clay----- Sandy clay loam-- Clay loam-----	SM, SM-SC CL, CH, SC CL, CH, SC CL, CH, SC	A-2 A-7 A-7 A-6, A-7	0-2 0-2 0-2 0	85-100 85-100 85-100 90-100	80-100 80-100 80-100 85-100	50-75 70-100 70-100 75-100	15-35 45-65 45-85 40-70	<25 45-60 45-60 35-55	NP-6 25-40 25-40 15-35
TeA----- Telferner	0-16 16-24 24-80	Fine sandy loam-- Sandy clay, clay Sandy clay loam, clay loam, sandy clay.	CL, SC, SM, CL-ML CH CL	A-4 A-7-6 A-6, A-7-6	0 0 0	98-100 98-100 98-100	98-100 98-100 98-100	80-100 90-100 85-100	40-60 55-85 50-75	17-30 51-65 30-45	3-10 30-40 15-29
TeB----- Telferner	0-12 12-40 40-60	Fine sandy loam-- Sandy clay----- Sandy clay loam--	CL, SC, SM, CL-ML CH CL	A-4 A-7-6 A-6, A-7	0 0 0	98-100 98-100 98-100	98-100 98-100 98-100	80-100 90-100 85-100	40-60 55-85 50-75	20-30 51-65 30-45	5-10 30-40 15-25
TfB*: Telferner-----	0-16 16-24 24-80	Fine sandy loam-- Sandy clay----- Sandy clay loam, clay loam.	CL, SC, SM, CL-ML CH CL	A-4 A-7-6 A-6, A-7	0 0 0	98-100 98-100 98-100	98-100 98-100 98-100	80-100 90-100 85-100	40-60 55-85 50-75	20-30 51-65 30-45	5-10 30-40 15-25
Urban land.											
TgC----- Tremona	0-35 35-56 56-80	Gravelly loamy sand, very gravelly loamy sand. Sandy clay, clay Sandy clay loam--	GP-GM, GM, SM, SP-SM SC, CL, CH SC, CL, CH	A-1, A-3, A-2-4 A-7 A-7, A-6, A-2-7, A-2-6	0-5 0 0	20-80 80-100 80-100	15-80 80-100 80-100	10-75 75-100 70-100	6-20 36-85 30-85	<25 40-60 30-60	NP-3 20-40 15-40
To, Tr----- Trinity	0-80	Clay-----	CH	A-7	0	100	98-100	85-100	80-100	55-90	30-60

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	<u>In</u>				<u>Pct</u>					<u>Pct</u>	
VaD----- Valco	0-15	Clay loam-----	CL	A-6, A-7-6	0-5	75-95	60-90	55-80	51-70	34-43	14-21
	15-40	Cemented-----	---	---	---	---	---	---	---	---	---
WeB----- Weesatche	0-13	Sandy clay loam--	SC, CL	A-6, A-7, A-2-6, A-2-7	0	80-100	80-100	65-98	28-65	28-45	13-28
	13-35	Sandy clay loam, clay loam.	SC, CL	A-6, A-7, A-2-6, A-2-7	0	80-100	80-100	65-98	28-75	36-50	21-30
	35-60	Sandy clay loam, fine sandy loam, loam.	SC, CL	A-6, A-7, A-2-6, A-2-7	0	80-100	80-100	55-100	28-80	33-50	20-30
WeC----- Weesatche	0-12	Sandy clay loam--	SC, CL	A-6, A-7, A-2-6, A-2-7	0	80-100	80-100	65-98	28-65	28-45	13-28
	12-17	Sandy clay loam--	SC, CL	A-6, A-7, A-2-6, A-2-7	0	80-100	80-100	65-98	28-75	36-50	21-30
	17-40	Clay loam-----	SC, CL	A-6, A-7, A-2-6, A-2-7	0	80-100	80-100	55-100	28-80	33-50	20-30
Za----- Zalco	0-80	Fine sand, loamy fine sand.	SM, SM-SC, SP-SM	A-2-4	0	95-100	95-100	70-85	10-25	<25	NP-7

\* See description of the map unit for composition and behavior characteristics of the map unit.



TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	In/hr	In/in	pH	Mmhos/cm				Pct
Ar----- Aransas	0-60	35-60	<0.06	0.01-0.12	7.9-9.0	4-16	High-----	0.32	5	1-4
Au----- Austwell	0-18	40-60	<0.06	0.05-0.15	7.9-8.4	2-16	High-----	0.32	5	---
	18-42	40-60	<0.06	0.02-0.15	7.9-8.4	>4	High-----	0.32		
	42-60	30-60	<0.06	0.02-0.10	7.9-8.4	>4	High-----	0.32		
DaA----- Dacosta	0-12	20-35	0.2-0.6	0.15-0.20	6.1-7.3	<2	Moderate-----	0.32	5	1-3
	12-40	30-45	<0.06	0.15-0.18	6.6-8.4	<4	High-----	0.32		
	40-80	30-45	<0.06	0.13-0.15	7.4-8.4	<8	High-----	0.32		
DaB----- Dacosta	0-9	20-35	0.2-0.6	0.15-0.20	6.1-7.3	<2	Moderate-----	0.32	5	1-3
	9-41	30-45	<0.06	0.15-0.18	6.6-8.4	<4	High-----	0.32		
	41-80	30-45	<0.06	0.13-0.15	7.4-8.4	<8	High-----	0.32		
DnA*: Dacosta-----	0-11	30-40	0.2-0.6	0.15-0.20	6.1-7.3	<2	Moderate-----	0.32	5	1-3
	11-50	40-60	<0.06	0.15-0.18	6.6-8.4	<4	High-----	0.32		
	50-80	40-60	<0.06	0.13-0.15	7.4-8.4	<8	High-----	0.32		
Contee-----	0-9	35-50	<0.06	0.14-0.18	7.9-8.4	<2	High-----	0.32	5	1-3
	9-56	40-60	<0.06	0.14-0.18	7.9-8.4	<4	High-----	0.32		
	56-80	40-60	<0.06	0.13-0.17	7.9-8.4	<8	High-----	0.32		
DuB*: Dacosta-----	0-12	20-35	0.2-0.6	0.15-0.20	6.1-7.3	<2	Moderate-----	0.32	5	1-3
	12-40	30-45	<0.06	0.15-0.18	6.6-8.4	<4	High-----	0.32		
	40-80	30-45	<0.06	0.13-0.15	7.4-8.4	<8	High-----	0.32		
Urban land.										
DvC*: Dacosta-----	0-2	20-35	0.2-0.6	0.15-0.20	6.1-7.8	<2	Moderate-----	0.32	5	1-3
	2-80	30-45	<0.06	0.15-0.18	6.6-8.4	<4	High-----	0.32		
Telferner-----	0-16	8-18	0.6-2.0	0.10-0.15	6.1-7.3	<2	Low-----	0.49	5	1-3
	16-80	35-50	<0.06	0.14-0.17	6.1-8.4	<2	High-----	0.32		
Dw----- Degola	0-25	20-35	0.6-2.0	0.12-0.20	6.1-7.8	<2	Low-----	0.32	5	1-3
	25-60	20-35	0.6-2.0	0.12-0.20	6.6-8.4	<2	Low-----	0.32		
DxB*: Denhawken-----	0-5	35-45	0.2-0.6	0.15-0.20	7.9-8.4	<2	Moderate-----	0.32	5	1-3
	5-73	35-55	<0.06	0.14-0.18	7.9-8.4	<2	High-----	0.32		
Elmendorf-----	0-11	20-35	0.2-0.6	0.15-0.20	6.6-8.4	<2	Moderate-----	0.32	5	1-3
	11-80	30-50	<0.06	0.15-0.20	7.4-8.4	<2	High-----	0.32		
EdA----- Edna	0-8	12-20	0.6-2.0	0.10-0.15	5.1-7.3	<2	Low-----	0.43	5	.5-3
	8-18	35-50	<0.06	0.15-0.20	5.6-7.3	<2	High-----	0.37		
	18-41	35-50	<0.06	0.15-0.20	6.6-8.4	<2	High-----	0.37		
	41-80	30-40	<0.06	0.15-0.20	6.6-8.4	<2	High-----	0.37		
EdB----- Edna	0-9	12-20	0.6-2.0	0.10-0.15	5.1-7.3	<2	Low-----	0.43	5	.5-3
	9-29	35-50	<0.06	0.15-0.20	5.6-7.3	<2	High-----	0.37		
	29-49	35-50	<0.06	0.15-0.20	6.6-8.4	<2	High-----	0.37		
	49-80	30-40	<0.06	0.15-0.20	6.6-8.4	<2	High-----	0.37		
FaA----- Faddin	0-16	6-15	0.6-2.0	0.12-0.17	6.1-7.3	<2	Low-----	0.43	5	1-3
	16-46	35-57	<0.06	0.14-0.19	6.1-8.4	<2	High-----	0.32		
	46-80	30-45	0.06-0.2	0.14-0.18	7.4-8.4	<2	Moderate-----	0.32		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	In/hr	In/in	pH	Mmhos/cm				Pct
FaB----- Faddin	0-16 16-39 39-60	6-15 35-57 30-45	0.6-2.0 <0.06 0.06-0.2	0.12-0.17 0.14-0.19 0.14-0.18	6.1-7.3 6.1-8.4 7.4-8.4	<2 <2 <2	Low----- High----- Moderate-----	0.43 0.32 0.32	5	1-3
FaC----- Faddin	0-14 14-44 44-60	6-15 35-57 30-45	0.6-2.0 <0.06 0.06-0.2	0.12-0.17 0.14-0.19 0.14-0.18	6.1-7.3 6.1-8.4 7.4-8.4	<2 <2 <2	Low----- High----- Moderate-----	0.43 0.32 0.32	5	1-3
FoB----- Fordtran	0-37 37-70	5-12 35-50	2.0-6.0 <0.06	0.07-0.11 0.15-0.18	5.1-6.5 5.1-7.8	<2 <2	Low----- Moderate-----	0.24 0.32	5	<2
GaC----- Garcitas	0-21 21-29 29-80	3-9 40-60 20-45	6.0-20 <0.06 0.06-0.2	0.02-0.06 0.08-0.15 0.08-0.15	5.6-6.5 3.6-6.0 4.5-6.5	<2 <2 <2	Low----- Moderate----- Moderate-----	0.10 0.15 0.28	5	<2
GdC----- Goldmire	0-3 3-49 49-80	2-10 18-35 18-35	6.0-20 0.2-0.6 0.2-0.6	0.01-0.03 0.06-0.12 0.08-0.14	4.5-6.0 3.6-5.5 3.6-5.5	<2 <2 <2	Very low----- Low----- Low-----	0.10 0.10 0.10	5	<2
InB----- Inez	0-14 14-49 49-80	6-18 35-55 25-40	0.6-2.0 <0.06 0.06-0.2	0.09-0.13 0.14-0.19 0.14-0.19	6.1-7.3 4.5-7.3 6.6-8.4	<2 <2 <2	Low----- High----- Moderate-----	0.43 0.32 0.32	5	<2
KyC----- Kuy	0-51 51-80	5-12 20-35	6.0-20 0.6-20	0.07-0.11 0.12-0.17	6.1-7.3 5.1-6.5	<2 ---	Low----- Low-----	0.17 0.24	5	<1
LaA----- Lake Charles	0-23 23-54 54-80	40-60 40-60 40-60	0.06-0.2 <0.06 <0.06	0.15-0.20 0.15-0.20 0.15-0.20	5.6-7.8 6.6-8.4 6.6-8.4	<2 <2 <2	High----- High----- High-----	0.32 0.32 0.32	5	2-6
LaB----- Lake Charles	0-47 47-56 56-80	40-60 40-60 40-60	0.06-0.2 <0.06 <0.06	0.15-0.20 0.15-0.20 0.15-0.20	5.6-7.8 6.6-8.4 6.6-8.4	<2 <2 <2	High----- High----- High-----	0.32 0.32 0.32	5	2-6
LaD----- Lake Charles	0-24 24-60 60-80	40-60 40-60 40-60	0.06-0.2 <0.06 <0.06	0.15-0.20 0.15-0.20 0.15-0.20	5.6-7.8 6.6-8.4 6.6-8.4	<2 <2 <2	High----- High----- High-----	0.32 0.32 0.32	5	2-6
LcB*: Lake Charles----	0-23 23-54 54-80	40-60 40-60 40-60	0.06-0.2 <0.06 <0.06	0.15-0.20 0.15-0.20 0.15-0.20	5.6-7.8 6.6-8.4 6.6-8.4	<2 <2 <2	High----- High----- High-----	0.32 0.32 0.32	5	2-6
Urban land.										
LmB----- Leming	0-29 29-60 60-80	3-18 35-50 27-45	2.0-6.0 0.06-0.2 0.6-2.0	0.05-0.10 0.15-0.20 0.14-0.18	6.1-7.3 6.1-8.4 6.6-8.4	<2 <2 <2	Very low----- Moderate----- Moderate-----	0.20 0.32 0.32	5	<1
Me----- Meguin	0-13 13-80	40-50 25-35	0.6-2.0 0.6-2.0	0.12-0.18 0.15-0.22	7.9-8.4 7.9-8.4	<2 <2	High----- Moderate-----	0.43 0.43	5	1-3
Mf----- Meguin	0-10 10-60	40-50 25-35	0.6-2.0 0.6-2.0	0.12-0.18 0.15-0.22	7.9-8.4 7.9-8.4	<2 <2	High----- Moderate-----	0.43 0.43	5	1-3
NcA*: Nada-----	0-8 8-25 25-80	2-15 20-35 15-30	0.6-2.0 <0.06 0.06-0.2	0.10-0.15 0.12-0.18 0.12-0.17	5.6-7.3 5.6-7.3 7.4-8.4	<2 <4 <8	Low----- Moderate----- Moderate-----	0.43 0.32 0.32	5	<1
Cieno-----	0-6 6-51 51-80	20-30 24-35 20-30	0.2-0.6 <0.06 0.06-0.2	0.12-0.18 0.12-0.18 0.12-0.18	5.6-7.3 5.6-8.4 7.4-8.4	<2 <2 <2	Moderate----- Moderate----- Moderate-----	0.32 0.32 0.32	5	1-3
PaB----- Papalote	0-16 16-45 45-80	6-17 35-55 30-40	2.0-6.0 0.06-0.2 0.06-0.2	0.11-0.15 0.13-0.18 0.12-0.17	5.6-7.8 6.1-8.4 6.6-8.4	<2 <2 <2	Low----- Moderate----- Moderate-----	0.32 0.32 0.32	5	.5-1

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	In/hr	In/in	pH	Mmhos/cm				Pct
Pb*. Pits										
Pd*. Pits and Dumps										
Pe----- Placedo	0-12 12-36 36-60	27-50 35-55 20-50	<0.06 <0.06 <0.06	0.-0.05 0.-0.01 0.-0.01	7.4-8.4 7.4-8.4 7.4-8.4	>8 >16 >16	High----- High----- Moderate-----	0.37 0.37 0.37	5	1-3
RaB----- Runge	0-9 9-60	8-20 22-35	2.0-6.0 0.6-2.0	0.11-0.16 0.14-0.20	6.6-7.8 6.6-8.4	<2 <2	Low----- Moderate-----	0.24 0.32	5	1-3
RaC----- Runge	0-12 12-60	8-20 22-35	2.0-6.0 0.6-2.0	0.11-0.16 0.14-0.20	6.6-7.8 6.6-8.4	<2 <2	Low----- Moderate-----	0.24 0.32	5	1-3
RbC----- Rupley	0-20 20-80	1-9 1-9	6.0-20 6.0-20	0.04-0.08 0.02-0.08	5.6-7.3 5.6-7.3	<2 <2	Very low----- Very low-----	0.15 0.15	5	<1
Rd----- Rydolph	0-9 9-80	35-50 20-40	0.06-0.2 0.06-0.2	0.14-0.18 0.14-0.20	7.9-8.4 7.9-8.4	<2 2-8	Moderate----- Moderate-----	0.43 0.43	5	1-3
Rf----- Rydolph	0-8 8-60	35-50 20-40	0.06-0.2 0.06-0.2	0.14-0.18 0.14-0.20	7.9-8.4 7.9-8.4	<2 2-8	Moderate----- Moderate-----	0.43 0.43	5	1-3
SaB----- Sarnosa	0-20 20-70	8-25 8-25	0.6-2.0 2.0-6.0	0.10-0.15 0.06-0.12	7.9-8.4 7.9-8.4	<2 <2	Low----- Low-----	0.24 0.24	5	1-3
SkC----- Silvern	0-46 46-70	0-5 18-35	6.0-20 0.6-2.0	0.01-0.04 0.05-0.10	5.1-6.5 3.6-5.5	<2 <2	Very low----- Low-----	0.10 0.10	5	<1
Sn----- Sinton	0-24 24-80	18-35 10-35	0.6-2.0 2.0-6.0	0.15-0.20 0.07-0.15	7.9-8.4 7.9-8.4	<2 <2	Low----- Low-----	0.28 0.20	---	1-3
StB----- Straber	0-13 13-46 46-65	5-12 35-50 35-50	2.0-6.0 0.06-0.2 0.06-0.2	0.07-0.11 0.14-0.18 0.14-0.18	5.6-6.5 4.5-5.5 5.6-7.3	<2 <2 <2	Very low----- Moderate----- Moderate-----	0.24 0.32 0.32	5	<1
StC----- Straber	0-12 12-25 25-53 53-80	5-12 35-50 35-50 25-45	2.0-6.0 0.06-0.2 0.06-0.2 0.06-0.2	0.07-0.11 0.14-0.18 0.14-0.18 0.11-0.18	5.6-6.5 4.5-5.5 4.5-6.0 5.6-8.4	<2 <2 <2 <2	Very low----- Moderate----- Moderate----- Moderate-----	0.24 0.32 0.32 0.37	5	<1
TeA----- Telferner	0-16 16-24 24-80	8-18 35-50 20-40	0.6-2.0 <0.06 0.06-0.2	0.10-0.15 0.14-0.17 0.12-0.15	5.6-7.3 6.1-8.4 7.4-8.4	<2 <2 <2	Low----- High----- Moderate-----	0.49 0.32 0.32	5	<2
TeB----- Telferner	0-12 12-40 40-60	8-18 35-50 20-40	0.6-2.0 <0.06 0.06-0.2	0.10-0.15 0.14-0.17 0.12-0.15	5.6-7.3 6.1-8.4 7.4-8.4	<2 <2 <2	Low----- High----- Moderate-----	0.49 0.32 0.32	5	<2
TfB*: Telferner	0-16 16-24 24-80	8-18 35-50 20-40	0.6-2.0 <0.06 0.06-0.2	0.10-0.15 0.14-0.17 0.12-0.15	5.6-7.3 6.1-8.4 7.4-8.4	<2 <2 <2	Low----- High----- Moderate-----	0.49 0.32 0.32	5	<2
Urban land.										
TgC----- Tremona	0-35 35-56 56-80	2-10 35-50 25-45	6.0-20 <0.06 <0.06	0.01-0.07 0.12-0.18 0.12-0.18	5.1-6.5 4.5-6.0 4.5-8.4	<2 <2 <2	Very low----- High----- High-----	0.20 0.28 0.37	5	<1
To, Tr----- Trinity	0-80	60-80	<0.06	0.15-0.20	7.4-8.4	<2	Very high-----	0.32	5	1-4
VaD----- Valco	0-15 15-40	27-35 ---	0.6-2.0 ---	0.13-0.18 ---	7.9-8.4 ---	<2 ---	Low----- -----	0.28 ---	1	1-3

See footnote at end of table.



TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	<u>In</u>	<u>Pct</u>	<u>In/hr</u>	<u>In/in</u>	<u>pH</u>	<u>Mmhos/cm</u>				<u>Pct</u>
WeB----- Weesatche	0-13 13-35 35-60	14-26 22-35 20-33	0.6-2.0 0.6-2.0 0.6-2.0	0.12-0.17 0.15-0.20 0.10-0.15	6.6-7.8 7.4-8.4 7.9-8.4	<2 <2 <2	Moderate----- Moderate----- Moderate-----	0.32 0.32 0.32	5	1-3
WeC----- Weesatche	0-12 12-17 17-40	14-26 22-35 20-33	0.6-2.0 0.6-2.0 0.6-2.0	0.12-0.17 0.15-0.20 0.10-0.15	6.6-7.8 7.4-8.4 7.9-8.4	<2 <2 <2	Moderate----- Moderate----- Moderate-----	0.32 0.32 0.32	5	1-3
Za----- Zalco	0-80	0-8	6.0-20	0.05-0.11	6.6-8.4	<2	Low-----	0.17	5	<.5

\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "brief," "apparent," and "perched" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated]

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth*	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					<u>Ft</u>			<u>In</u>			
Ar----- Aransas	D	Frequent----	Brief to very long.	Apr-Oct	+3-5.0	Apparent	Apr-Oct	>60	---	High-----	Low.
Au----- Austwell	D	Frequent----	Long-----	Apr-Oct	+2-2.0	Apparent	Apr-Oct	>60	---	High-----	High.
DaA, DaB----- Dacosta	D	None-----	---	---	0-4.0	Apparent	Sep-Apr	>60	---	High-----	Low.
DnA**: Dacosta-----	D	None-----	---	---	0-4.0	Apparent	Sep-Apr	>60	---	High-----	Low.
Contee-----	D	None-----	---	---	0-3.0	Apparent	Sep-Apr	>60	---	High-----	Low.
DuB**: Dacosta-----	D	None-----	---	---	0-4.0	Apparent	Sep-Apr	>60	---	High-----	Low.
Urban land.											
DvC**: Dacosta-----	D	None-----	---	---	0-4.0	Apparent	Sep-Apr	>60	---	High-----	Low.
Telferner-----	D	None-----	---	---	0-2.0	Perched	Oct-Mar	>60	---	High-----	Low.
Dw----- Degola	B	Frequent----	Brief-----	Apr-Sep	>6.0	---	---	>60	---	Moderate	Low.
DxB**: Denhawken-----	D	None-----	---	---	>6.0	---	---	>60	---	High-----	Low.
Elmendorf-----	D	None-----	---	---	>6.0	---	---	>60	---	High-----	Low.
EdA, EdB----- Edna	D	None-----	---	---	0-1.5	Perched	Oct-Mar	>60	---	High-----	Low.
FaA, FaB, FaC----- Faddin	D	None-----	---	---	1.0-1.5	Perched	Oct-Mar	>60	---	High-----	Low.
FoB----- Fordtran	C	None-----	---	---	1.0-3.5	Perched	Oct-Apr	>60	---	High-----	Moderate.
GaC----- Garcitas	C	None-----	---	---	1.5-3.5	Perched	Sep-Mar	>60	---	High-----	High.
GdC----- Goldmire	C	None-----	---	---	>6.0	---	---	>60	---	Moderate	High.
InB----- Inez	D	None-----	---	---	0-1.5	Perched	Oct-Mar	>60	---	High-----	Low.
KyC----- Kuy	A	None-----	---	---	3.0-5.0	Perched	Oct-May	>60	---	High-----	Moderate.
LaA, LaB, LaD----- Lake Charles	D	None-----	---	---	0-2.0	Apparent	Sep-Mar	>60	---	High-----	Low.
LcB**: Lake Charles-----	D	None-----	---	---	0-2.0	Apparent	Sep-Mar	>60	---	High-----	Low.
Urban land.											
LmB----- Leming	C	None-----	---	---	>6.0	---	---	>60	---	High-----	Low.

See footnotes at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth*	Kind	Months	Depth	Hard-ness	Uncoated steel	Concrete
					<u>Ft</u>			<u>In</u>			
Me----- Meguin	B	Occasional	Very brief	Apr-Oct	>6.0	---	---	>60	---	High-----	Low.
Mf----- Meguin	B	Frequent----	Brief-----	Apr-Oct	>6.0	---	---	>60	---	High-----	Low.
NcA#: Nada-----	D	None-----	---	---	0-1.0	Perched	Oct-May	>60	---	High-----	Low.
Cieno-----	D	None-----	---	---	+1-1.5	Perched	Oct-May	>60	---	High-----	Low.
PaB----- Papalote	C	None-----	---	---	>6.0	---	---	>60	---	High-----	Low.
Pb**. Pits											
Pd**. Pits and Dumps											
Pe----- Placedo	D	Frequent----	Long-----	Jan-Dec	+2-1.0	Apparent	Jan-Dec	>60	---	High-----	High.
RaB, RaC----- Runge	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	Low.
RbC----- Rupley	A	None-----	---	---	5.0-6.0	Apparent	Sep-May	>60	---	Low-----	Low.
Rd----- Rydolph	C	Occasional	Very brief to brief.	Apr-Oct	2.0-5.0	Apparent	Nov-Apr	>60	---	High-----	Low.
Rf----- Rydolph	C	Frequent----	Very brief to brief.	Apr-Oct	2.0-5.0	Apparent	Nov-Apr	>60	---	High-----	Low.
SaB----- Sarnosa	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	Low.
SkC----- Silvern	A	None-----	---	---	>6.0	---	---	>60	---	Moderate	High.
Sn----- Sinton	B	Occasional	Very brief to brief.	Apr-Oct	>6.0	---	---	>60	---	Moderate	Low.
StB, StC----- Straber	C	None-----	---	---	>6.0	---	---	>60	---	High-----	High.
TeA, TeB----- Telferner	D	None-----	---	---	0-2.0	Perched	Oct-Mar	>60	---	High-----	Low.
TfB**: Telferner----- Urban land.	D	None-----	---	---	0-2.0	Perched	Oct-Mar	>60	---	High-----	Low.
TgC----- Tremona	C	None-----	---	---	1.5-3.5	Perched	Sep-Jun	>60	---	High-----	High.
To----- Trinity	D	Occasional	Very brief to brief.	Apr-Oct	0-3.0	Apparent	Nov-Feb	>60	---	High-----	Low.
Tr----- Trinity	D	Frequent----	Brief to long.	Apr-Oct	0-3.0	Apparent	Nov-Feb	>60	---	High-----	Low.
VaD----- Valco	C	None-----	---	---	>6.0	---	---	>60	---	Moderate	Low.
WeB, WeC----- Weesatche	B	None-----	---	---	>6.0	---	---	>60	---	High-----	Low.

See footnotes at end of table.



TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro- logic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth*	Kind	Months	Depth	Hard- ness	Uncoated steel	Concrete
Za----- Zalco	A	Frequent----	Brief-----	Apr-Oct	<u>Ft</u> >6.0	---	---	<u>In</u> >60	---	High-----	Low.

\* A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

\*\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--PHYSICAL PROPERTIES OF SELECTED SOILS

Soil series and sample numbers	Depth	Horizon	Particle-size distribution (percent less than 2 mm)								COLE*	Bulk density**	Water content	
			Sand					Silt (0.05- 0.002)	Clay <0.002	1/3 bar			15 bar	
			Very coarse (2.0- 1.0)	Coarse (1.0- 0.5)	Medium (0.5- 0.25)	Fine (0.25- 0.1)	Very fine (0.1- 0.05)							Total (2.0- 0.05)
	In										Cm/cm	G/cm <sup>3</sup>	---Pct (wt)---	
Cieno: (S79TX-469-001)														
79-1327	0-6	A1	0.1	1.4	9.4	14.2	23.3	48.4	29.0	22.6	0.030	1.78	17.9	9.7
79-1328	6-16	B21tg	TR	1.3	8.3	12.7	21.5	43.8	28.9	27.3	0.056	1.92	18.7	11.4
79-1329	16-28	B22tg	0.1	1.3	8.2	13.6	19.9	43.1	25.0	31.9	0.065	2.03	19.9	12.4
79-1330	28-40	B23tg	0.1	1.6	9.3	14.5	21.4	46.9	24.2	28.9	0.061	2.04	18.4	10.0
79-1331	40-51	B24tg	0.1	1.8	14.3	19.3	22.5	58.0	17.3	24.7	0.051	2.02	17.6	9.3
79-1332	51-62	B31g	0.1	1.8	15.0	20.0	22.7	59.6	17.0	23.4	0.052	2.12	15.2	8.8
79-1333	62-77	B32g	0.6	1.6	13.2	18.5	24.3	58.2	21.2	20.6	0.045	2.11	15.3	8.4
79-1334	77-80	B33g	TR	1.2	10.7	17.1	23.7	52.7	24.1	23.2	0.059	2.09	17.5	9.4
Dacosta: (S78TX-469-001)														
79-175	0-6	A1	0.1	0.5	8.1	20.0	32.4	61.1	19.0	19.9	0.033	1.72	17.8	10.0
79-176	6-12	B1g	TR	0.3	6.4	16.6	28.3	51.6	15.8	32.6	0.081	1.92	22.9	13.4
79-177	12-21	B21tg	TR	0.3	5.7	13.3	26.1	45.4	16.0	38.6	0.106	2.03	25.7	15.7
79-178	21-29	B22tg	TR	0.3	5.2	11.9	25.2	42.6	14.6	42.8	0.135	2.02	31.6	17.0
79-179	29-40	B23tg	0.1	0.3	5.6	13.6	22.7	42.3	14.6	43.1	0.139	1.98	32.4	16.9
79-180	40-52	B31g	0.2	0.4	6.1	14.3	30.5	51.5	12.7	35.8	0.068	1.82	23.9	14.9
79-181	52-78	B32g	TR	0.1	2.1	15.1	42.2	59.5	14.1	26.4	0.050	1.75	23.3	12.4
79-182	78-80	C	0.0	0.2	5.7	20.0	38.5	64.4	11.0	24.6	0.036	1.70	17.0	9.9
Faddin: (S78TX-469-002)														
79-183	0-16	A1	TR	0.3	8.4	27.7	35.8	72.2	18.8	9.0	0.008	1.65	10.2	4.2
79-184	16-24	B21tg	0.0	0.1	4.0	11.4	21.2	36.7	6.4	56.9	0.139	1.73	40.7	23.9
79-185	24-35	B22tg	0.0	0.1	4.1	14.0	24.1	42.3	10.3	47.4	0.109	1.97	28.4	20.0
79-186	35-46	B23tg	1.1	0.9	4.1	14.2	26.6	46.9	18.1	35.0	0.064	1.82	24.2	15.2
79-187	46-80	B3ca	0.4	0.5	3.1	13.0	24.3	41.3	25.1	33.6	0.073	1.82	25.7	14.6

See footnotes at end of table

TABLE 17.--PHYSICAL PROPERTIES OF SELECTED SOILS--Continued

Soil series and sample numbers	Depth	Horizon	Particle-size distribution (percent less than 2 mm)								COLE*	Bulk density**	Water content	
			Sand						Silt (0.05- 0.002)	Clay <0.002			1/3 bar	15 bar
			Very coarse (2.0- 1.0)	Coarse (1.0- 0.5)	Medium (0.5- 0.25)	Fine (0.25- 0.1)	Very fine (0.1- 0.05)	Total (2.0- 0.05)						
	In										Cm/cm	G/cm <sup>3</sup>	---Pct	(wt)---
Nada: (79TX-469-002)														
79-1336	0-8	A1	0.5	11.2	40.3	12.1	6.7	70.8	25.5	3.7	0.008	1.78	7.9	3.2
79-1337	8-14	B2ltg	0.1	1.9	9.9	13.6	24.8	50.3	17.0	32.7	0.108	2.04	25.3	13.0
79-1338	14-25	B22tg	0.1	1.9	10.1	15.3	23.5	50.9	24.7	24.4	0.058	1.92	20.0	10.8
79-1339	25-35	B23tg	0.2	2.1	11.4	16.5	25.0	55.2	25.9	18.9	0.061	2.15	15.7	8.8
79-1340	35-48	B24tg	0.2	1.8	12.1	17.7	24.9	56.7	22.3	21.0	0.056	2.06	16.2	8.2
79-1341	48-58	B25tg	0.1	1.8	12.2	18.3	24.7	57.1	23.6	19.3	0.039	2.15	13.8	8.0
79-1342	58-67	B25tg	0.1	1.5	11.0	18.9	27.2	58.7	23.8	17.5	0.038	2.09	13.5	7.7
79-1343	67-80	B3g	0.1	1.5	10.7	17.8	27.9	58.0	23.0	19.0	0.044	2.07	15.2	9.4
Rydolph: (S78TX-469-003)														
79-188	0-9	A1	0.2	0.2	0.3	5.0	7.3	13.0	47.3	39.7	0.111	1.84	31.9	19.4
79-189	9-32	C1	TR	TR	0.1	3.1	24.5	27.7	48.4	23.9	0.035	1.41	23.2	13.5
79-190	32-48	C2	0.2	0.1	0.1	1.9	11.9	14.2	47.9	37.9	0.147	1.81	39.9	21.1
79-191	48-59	C3	TR	TR	0.2	3.2	19.4	22.8	51.9	25.3	0.064	1.59	27.5	14.0
79-192	59-71	C4	0.1	0.2	0.3	4.5	9.7	14.8	53.2	32.0	0.076	1.63	29.6	18.4
79-193	71-80	C5	TR	TR	0.5	9.7	31.6	41.8	38.5	19.7	0.041	1.60	23.9	10.6

\*Coefficient of linear extensibility.

\*\*For the Cieno and Dacosta soils, bulk density was determined after air drying. For the Paddin, Nada, and Rydolph soils, it was determined after oven drying.



TABLE 18.--CHEMICAL PROPERTIES OF SELECTED SOILS

[Dashes indicate the test was not performed]

Soil series and sample numbers	Depth	Horizon	Extractable bases					Extract- able acidity	Cation exchange capacity	Base satura- tion	Organic carbon	pH		Exchange- able sodium	Sodium adsorp- tion ratio	Electrical conductiv- ity
			Ca	Mg	Na	K	Sum					H2O (1:1)	CaCl2 0.01M (1:2)			
	In		Meg/100g							Pct	Pct			Pct		Mmhos/ cm
Cieno: (S79TX-469-001)																
79-1327	0-6	A1	8.3	3.0	0.4	0.2	11.9	5.5	13.9	86	1.44	5.7	4.9	---	---	0.08
79-1328	6-16	B21tg	10.8	3.6	0.8	0.2	15.4	3.9	16.8	92	0.49	5.9	5.0	---	---	0.09
79-1329	16-28	B22tg	12.9	4.2	1.2	0.2	18.5	3.0	18.7	99	0.35	5.9	5.4	---	---	0.21
79-1330	28-40	B23tg	12.4	3.8	1.2	0.2	17.6	1.4	16.8	100	0.21	6.8	6.2	5	5	1.13
79-1331	40-51	B24tg	10.8	3.3	1.1	0.2	15.4	1.4	14.2	100	0.02	7.6	7.1	6	5	1.29
79-1332	51-62	B31g	11.5	3.2	1.1	0.1	15.9	0.8	13.9	100	0.04	8.0	7.5	6	5	1.13
79-1333	62-77	B32g	14.4	3.3	1.1	0.1	18.9	0.6	14.4	100	0.01	8.2	7.7	6	5	1.24
79-1334	77-80	B33g	14.8	4.1	1.2	0.1	20.2	1.3	18.7	100	0.01	8.1	7.6	5	4	1.06
Dacosta: (S78TX-469-001)																
79-175	0-6	A1	8.2	2.8	0.4	0.5	11.9	3.2	13.0	92	1.15	6.6	5.7	2	2	0.41
79-176	6-12	B1g	12.7	4.5	1.0	0.5	18.7	3.7	20.3	92	0.65	6.6	5.7	4	4	0.29
79-177	12-21	B21tg	14.4	5.5	1.6	0.5	22.0	3.6	24.0	92	0.43	6.7	5.7	6	6	0.47
79-178	21-29	B22tg	16.0	6.5	2.8	0.5	25.8	1.9	23.9	100	0.40	6.9	6.4	9	9	1.14
79-179	29-40	B23tg	17.1	6.9	4.1	0.6	28.7	0.5	25.7	100	0.26	7.6	7.5	10	10	3.19
79-180	40-52	B31g	23.7	6.5	3.9	0.6	34.7	---	21.7	100	0.10	7.8	7.7	11	10	4.15
79-181	52-78	B32g	11.7	4.6	3.0	0.6	19.9	1.1	16.7	100	0.05	7.8	7.6	11	9	3.35
79-182	78-90	C	9.4	3.5	2.1	0.5	15.5	0.8	13.9	100	0.04	7.0	6.7	9	9	2.94
Faddin: (S78TX-469-002)																
79-183	0-16	A1	4.3	0.9	0.1	0.2	5.5	1.7	6.3	87	0.62	6.2	5.5	1	1	0.35
79-184	16-24	B21tg	22.3	7.4	1.4	0.8	31.9	9.3	36.8	87	0.80	6.6	5.6	3	4	0.22

TABLE 18.--CHEMICAL PROPERTIES OF SELECTED SOILS--Continued

Soil series and sample numbers	Depth	Horizon	Extractable bases					Extract- able acidity	Cation exchange capacity	Base satura- tion	Organic carbon	pH		Exchange- able sodium	Sodium adsorp- tion ratio	Electrical conductiv- ity
			Ca	Mg	Na	K	Sum					H <sub>2</sub> O (1:1)	CaCl <sub>2</sub> 0.01M (1:2)			
	<u>In</u>		<u>Meg/100g</u>							<u>Pct</u>	<u>Pct</u>			<u>Pct</u>		<u>Mmhos/ cm</u>
Faddin: (S78TX-469-002)																
79-185	24-35	B22tg	20.1	7.0	1.6	0.6	29.3	4.3	31.4	93	0.24	7.1	6.1	5	4	0.24
79-186	35-46	B23tg	---	5.8	1.7	0.5	---	---	21.9	---	0.19	8.4	7.9	7	6	0.70
79-187	46-80	B3ca	---	4.6	1.8	0.5	---	---	18.3	---	0.08	8.7	7.8	8	7	0.66
Nada: (79TX-469-002)																
79-1336	0-8	A1	2.9	1.1	0.3	0.1	4.4	2.0	4.8	92	0.60	6.0	5.2	---	---	0.22
79-1337	8-14	B21tg	12.5	5.5	1.5	0.2	19.7	6.2	22.3	88	0.63	6.2	5.5	---	---	0.11
79-1338	14-25	B22tg	10.7	4.8	1.8	0.1	17.4	2.3	17.3	100	0.23	7.1	6.4	---	---	0.19
79-1339	25-35	B23tg	10.7	4.1	2.1	0.1	17.0	1.1	14.7	100	0.08	8.1	7.7	10	8	2.30
79-1340	35-48	B24tg	10.6	4.1	2.8	0.1	17.6	1.5	13.7	100	0.05	7.7	7.5	10	8	5.29
79-1341	48-58	B25tg	11.0	4.0	2.6	0.1	17.7	1.6	12.9	100	0.03	7.9	7.7	11	9	4.70
79-1342	58-67	B25tg	8.5	3.4	2.0	0.1	14.0	2.2	11.9	100	0.02	7.7	7.4	11	8	3.27
79-1343	67-80	B3g	12.0	4.2	2.2	0.2	18.6	1.7	16.7	100	0.01	7.5	7.1	9	8	2.71
Rydolph: (S78TX-469-003)																
79-188	0-9	A1	---	2.4	4.7	1.3	---	---	26.0	---	1.12	8.5	7.9	15	14	1.16
79-189	9-32	C1	---	1.2	11.9	0.6	---	---	13.9	---	0.29	9.2	8.9	68	74	3.35
79-190	32-48	C2	---	1.6	20.9	0.9	---	---	21.4	---	0.55	8.9	8.8	74	91	4.60
79-191	48-59	C3	---	1.2	15.4	0.6	---	---	14.1	---	0.96	8.9	8.7	73	98	6.03
79-192	59-71	C4	---	1.4	18.7	0.8	---	---	18.1	---	0.99	8.8	8.6	71	95	5.78
79-193	71-80	C5	---	1.0	13.5	0.6	---	---	10.9	---	2.38	8.9	8.6	77	119	5.78

TABLE 19.--CLAY MINERALOGY OF SELECTED SOILS

Soil series and sample numbers	Depth	Horizon	Clay minerals*						
			Mont- morillonite	14 Angstrom intergrade mica	Kaolinite	Calcite	Quartz	Chlorite	Lepidocrocite
	<u>In</u>								
Cieno:									
79-1333	62-77	B32g	5	---	3	---	3	1	---
Dacosta:									
79-177	12-21	B2ltg	5	3	3	---	1	---	---
79-181	52-78	B32g	5	3	3	---	1	---	---
Faddin:									
79-184	16-24	B2ltg	5	3	3	---	---	---	1
79-187	46-80	B3ca	5	3	3	2	---	---	---
Nada:									
79-1342	58-67	B25tg	5	1	3	---	3	---	---
Rydolph:									
79-189	9-32	C1	4	3	2	2	---	---	---
79-193	71-80	C5	5	3	3	2	---	---	---

\*Relative amounts: 5, dominant; 4, abundant; 3, moderate; 2, small; 1, trace.



TABLE 20.--ENGINEERING INDEX TEST DATA

Soil name, report number, horizon, and depth in inches	Classification		Grain-size distribution <sup>1</sup>											Liquid limit <sup>2</sup>	Plasticity index <sup>2</sup>	Specific gravity	Shrinkage		
			Percentage passing sieve--								Percentage smaller than--						Limit	Linear	Ratio
	AASHTO	Unified	7/4	5/8	3/8	No.	No.	No.	No.	.05	.005	.002							
			inch	inch	inch	4	10	40	200	mm	mm	mm							
Cieno sandy clay loam: <sup>3</sup> (S79TX-469-001)													Pct		G/cm <sup>3</sup>	Pct	Pct	Pct	
A1-----0 to 6	A-6 (07)	CL	100	100	100	100	100	97	59	46	34	27	30	17	2.59	13.0	8.7	1.8	
B21tg-----6 to 16	A-6 (15)	CL	100	100	100	100	100	98	67	57	42	35	36	27	2.63	10.0	13.3	2.0	
B22tg-----16 to 28	A-6 (16)	CL	100	100	100	100	100	99	66	53	42	36	39	29	2.62	8.0	14.8	2.0	
B31g-----51 to 62	A-6 (04)	SC	100	100	100	100	100	96	46	38	28	23	31	19	2.65	11.0	9.8	1.9	
Dacosta sandy clay loam: <sup>4</sup> (S77TX-469-003)																			
A1-----4 to 15	A-6 (13)	CL	100	100	100	100	100	100	66	56	36	30	37	24	2.61	14.0	11.5	1.8	
B21tg-----15 to 36	A-7-6(23)	CL	100	100	100	100	100	100	72	65	48	43	49	35	2.67	11.0	17.7	2.0	
C-----50 to 60	A-7-6(21)	CL	100	100	100	100	99	98	69	62	43	38	49	33	2.67	13.0	16.0	1.9	
Faddin fine sandy loam: <sup>5</sup> (S78TX-469-001)																			
A1-----0 to 16	A-4 (00)	SM-SC	100	100	100	100	100	99	38	30	10	8	19	4	2.62	16.0	2.4	1.8	
B21tg-----16 to 24	A-7-6(26)	CH	100	100	100	100	100	100	68	58	48	45	65	38	2.65	12.0	21.1	1.9	
B22tg-----24 to 35	A-7-6(25)	CH	100	100	100	100	100	100	64	53	41	38	63	42	2.69	12.0	20.7	1.9	
B23tg-----35 to 46	A-7-6(14)	CL	100	100	100	100	99	96	60	57	40	35	46	29	2.65	13.0	15.3	1.9	
Garcitas gravelly loamy fine sand: <sup>6</sup> (S79TX-469-004)																			
A11-----0 to 5	A-2-4(00)	SM	100	94	88	84	80	61	21	15	6	4	15	3	2.62	14.0	0.8	1.9	
A12-----5 to 21	A-1-A(01)	GP-GM	100	76	65	46	29	16	6	4	2	1	16	4	2.63	13.0	2.0	1.9	
B21tg-----21 to 29	A-7-6(23)	CH	100	90	87	82	77	69	57	54	46	43	68	46	2.70	9.0	23.5	2.0	

See footnotes at end of table.

TABLE 20.--ENGINEERING INDEX TEST DATA--Continued

Soil name, report number, horizon, and depth in inches	Classification		Grain-size distribution <sup>1</sup>										Liquid limit <sup>2</sup>  Pct	Plasticity index <sup>3</sup>	Specific gravity  G/cm <sup>3</sup>	Shrinkage		
			Percentage passing sieve--								Percentage smaller than--					Limit	Linear	Ratio
	AASHTO	Unified	7/4	5/8	3/8	No. 4	No. 10	No. 40	No. 200	.05 mm	.005 mm	.002 mm						
			inch	inch	inch													
Inez fine sandy loam: <sup>7</sup> (S79TX-469-003)																		
A1-----0 to 8	A-4 (00)	SM	100	100	100	100	100	98	43	32	9	5	15	3	2.57	11.0	2.2	1.9
B21tg----14 to 26	A-7-6(27)	CH	100	100	100	100	100	99	72	68	54	30	59	39	2.60	11.0	19.8	1.9
B22tg----26 to 42	A-7-6(16)	CL	100	100	100	100	100	97	63	60	39	35	45	30	2.62	10.0	15.8	2.0
B23tg----42 to 49	A-7-6(17)	CL	100	100	100	100	100	98	61	53	37	33	47	33	2.65	11.0	16.5	2.0
B32g----70 to 80	A-7-6(21)	CL	100	100	100	100	100	98	67	60	38	34	49	36	2.69	11.0	17.8	2.0
Kuy loamy sand: <sup>8</sup> (S79TX-469-005)																		
A2-----17 to 68	A-2-4(00)	SM	100	100	100	100	100	99	16	15	2	2	24	1	2.63	19.0	0.4	1.6
B21tg----68 to 74	A-6 (02)	SC	100	100	100	100	100	99	44	33	24	20	28	12	2.63	16.0	5.4	1.7
B22tg----74 to 80	A-4 (00)	SM-SC	100	100	100	100	100	99	41	33	19	16	21	7	2.65	16.0	3.1	1.8
Lake Charles clay: <sup>9</sup> (S77TX-469-001)																		
A11-----0 to 11	A-7-6(34)	CH	100	100	100	100	100	100	82	74	54	47	60	40	2.63	12.0	20.0	1.9
A13-----23 to 46	A-7-6(38)	CH	100	100	100	100	100	99	82	79	57	52	64	45	2.65	11.0	22.0	2.0
C-----54 to 80	A-7-6(42)	CH	100	100	100	100	98	96	81	77	58	50	68	50	2.72	8.0	23.6	2.0
Nada sandy loam: <sup>10</sup> (S79TX-469-002)																		
A1-----0 to 8	A-4 (00)	SM	100	100	100	100	100	95	40	30	11	8	16	3	2.63	13.0	1.8	1.8
B22tg----14 to 25	A-7-6(14)	CL	100	100	100	100	100	97	60	53	37	34	42	30	2.66	10.0	15.2	2.0
B24tg----35 to 48	A-6 (07)	CL	100	100	100	100	100	99	55	46	30	26	32	20	2.66	11.0	11.0	2.0
B3g-----67 to 80	A-6 (06)	SC	100	100	100	100	100	97	49	44	26	24	34	21	2.67	12.0	11.3	1.9
Rydolph silty clay: <sup>11</sup> (S78TX-469-002)																		
A1-----0 to 9	A-7-6(34)	CH	100	100	100	100	100	100	91	89	57	43	55	35	2.65	14.0	17.7	1.9
C1-----9 to 32	A-7-6(20)	CL	100	100	100	100	100	100	82	75	31	23	42	25	2.67	20.0	10.0	1.7
C2-----32 to 48	A-7-6(39)	CH	100	100	100	100	100	100	90	84	56	40	61	40	2.69	15.0	20.0	1.8

See footnotes at end of table.

TABLE 20.--ENGINEERING INDEX TEST DATA--Continued

Soil name, report number, horizon, and depth in inches	Classification		Grain-size distribution <sup>1</sup>										Liquid <sup>2</sup> limit	Plasticity index <sup>2</sup>	Specific gravity	Shrinkage		
			Percentage passing sieve--							Percentage smaller than--						Limit	Linear	Ratio
	AASHTO	Unified	7/4 inch	5/8 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.05 mm	.005 mm	.002 mm						
Telferner fine sandy loam: <sup>12</sup> (S77TX-469-002)													Pct		G/cm <sup>3</sup>	Pct	Pct	Pct
A1-----0 to 10	A-4 (00)	SM	100	100	100	100	100	98	42	33	8	5	17	3	2.63	16.0	0.8	1.8
B21tg----16 to 24	A-7-6(25)	CH	100	100	100	100	100	99	71	69	56	50	57	37	2.67	10.0	19.6	1.9
B22tg----24 to 40	A-7-6(15)	CL	100	100	100	100	100	99	62	56	36	33	43	29	2.66	12.0	14.7	1.9

<sup>1</sup>For soil materials larger than 3/8 inch, square mesh wire sieves were used that are slightly larger than equivalent round sieves, but these differences do not seriously affect the data.

<sup>2</sup>Liquid limit and plasticity index values were determined by the AASHTO-89 and AASHTO-90 methods except that soil was added to water.

<sup>3</sup>Cieno sandy clay loam:

From junction U.S. Highway 77 and Farm Road 1315 in Victoria, 11.8 miles northeast on Farm Road 1315, 450 feet southeast in rangeland.

<sup>4</sup>Dacosta sandy clay loam:

From Guadalupe, 0.6 mile northeast on Wood H1 Road, and 264 feet north in a field.

<sup>5</sup>Faddin fine sandy loam:

From junction Farm Road 445 and U.S. Highway 77, 1.9 miles east on Farm Road 445, 1.0 mile northeast and north, 0.45 mile east, 50 feet north in rangeland.

<sup>6</sup>Garcitas gravelly loamy fine sand:

From junction U.S. Highways 77 and 59 in Victoria, 16.3 miles north on U.S. Highway 77 and 115 feet west in rangeland.

<sup>7</sup>Inez fine sandy loam:

From junction U.S. Highway 59 and Farm Road 444 in Inez, 1.9 miles northwest on Farm Road 444, 1.3 miles northwest, 1.4 miles northeast, 15 feet southeast.

<sup>8</sup>Kuy loamy sand:

From junction U.S. Highways 59 and 87 in Victoria, 6.5 miles north on U.S. Highway 87, 0.5 mile west on gravel road, 480 feet north and 50 feet west.

<sup>9</sup>Lake Charles clay:

From junction U.S. Highway 87 and Farm Road 1686, 2.4 miles northeast on Farm Road 1686, 290 feet north in rangeland microdepression.

<sup>10</sup>Nada sandy loam:

From junction U.S. Highway 77 and Farm Road 1315 in Victoria, 11.9 miles northeast on Farm Road 1315, 455 feet southeast in rangeland.

<sup>11</sup>Rydolph silty clay:

From junction Farm Road 445 and U.S. Highway 77, 2.5 miles east on Farm Road 445, 1.2 miles south, 1.3 miles east and 50 feet north in rangeland.

<sup>12</sup>Telferner fine sandy loam:

From junction of U.S. Highway 59 and Farm Road 1686 in Telferner, 1.1 miles northeast on U.S. Highway 59 and 85 feet north in rangeland.



TABLE 21.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Aransas-----	Fine, montmorillonitic (calcareous), hyperthermic Vertic Haplaquolls
Austwell-----	Fine, montmorillonitic (calcareous), hyperthermic Typic Haplaquepts
Cieno-----	Fine-loamy, siliceous, hyperthermic Typic Ochraqualfs
Contee-----	Fine, montmorillonitic (calcareous), hyperthermic Vertic Haplaquepts
Dacosta-----	Fine, montmorillonitic, hyperthermic Vertic Ochraqualfs
*Degola-----	Fine-loamy, mixed, hyperthermic Cumulic Haplustolls
Denhawken-----	Fine, montmorillonitic, hyperthermic Vertic Ustochrepts
Edna-----	Fine, montmorillonitic, thermic Vertic Albaqualfs
Elmendorf-----	Fine, montmorillonitic, hyperthermic Vertic Argiustolls
Faddin-----	Fine, montmorillonitic, hyperthermic Abruptic Argiaquolls
Fordtran-----	Clayey, mixed, hyperthermic Arenic Albaqualfs
Garcitas-----	Clayey, mixed, hyperthermic Aquic Arenic Paleustalfs
Goldmire-----	Loamy-skeletal, siliceous, thermic Aquic Paleustalfs
Inez-----	Fine, montmorillonitic, hyperthermic Typic Albaqualfs
Kuy-----	Loamy, siliceous, hyperthermic Grossarenic Paleudalfs
Lake Charles-----	Fine, montmorillonitic, thermic Typic Pelluderts
Leming-----	Clayey, mixed, hyperthermic Aquic Arenic Paleustalfs
Meguín-----	Fine-silty, mixed, hyperthermic Fluventic Haplustolls
Nada-----	Fine-loamy, siliceous, hyperthermic Typic Albaqualfs
Papalote-----	Fine, mixed, hyperthermic Aquic Paleustalfs
Placedo-----	Fine, montmorillonitic, nonacid, hyperthermic Typic Fluvaquents
*Runge-----	Fine-loamy, mixed, hyperthermic Typic Argiustolls
Rupley-----	Siliceous, hyperthermic Typic Udipsamments
Rydolph-----	Fine-silty, mixed (calcareous), hyperthermic Aeris Fluvaquents
Sarnosa-----	Coarse-loamy, mixed, hyperthermic Typic Calciustolls
Silvern-----	Loamy-skeletal, siliceous, thermic Grossarenic Paleustalfs
Sinton-----	Fine-loamy, mixed, hyperthermic Cumulic Haplustolls
Straber-----	Fine, mixed, thermic Aquic Paleustalfs
Telferner-----	Fine, montmorillonitic, hyperthermic Typic Albaqualfs
Tremona-----	Clayey, mixed, thermic Aquic Arenic Paleustalfs
Trinity-----	Very-fine, montmorillonitic, thermic Typic Pelluderts
*Valco-----	Loamy, mixed, hyperthermic, shallow Petrocalcic Calciustolls
Weesatche-----	Fine-loamy, mixed, hyperthermic Typic Argiustolls
Zalco-----	Sandy, siliceous, hyperthermic Typic Udifluvents

\*The soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series.

TABLE 22.--GEOLOGY OF VICTORIA COUNTY, BY GENERAL SOIL MAP UNIT

Map unit	Geologic unit	Age
Most of the Meguin-Trinity, Rydolph-Trinity, and Aransas-Austwell.	Alluvium-----	Holocene.
Minor parts of the Meguin-Trinity, Lake Charles-Dacosta, Faddin-Edna, and Telferner-Edna.	Deweyville terraces and terrace deposits.	Late Pleistocene.
Most of the Lake Charles-Dacosta and Faddin-Edna and minor parts of the Telferner-Edna.	Beaumont Formation--	Pleistocene.
All of the Inez, southeastern part of Nada-Telferner, and southern part of Straber.	Lissie Formation----	Pleistocene.
All of the Garcitas, northwestern part of Nada-Telferner, isolated patches and northern parts of Straber, and isolated patches of Weesatche-Papalote.	Willis Formation----	Plio-Pleistocene.
Most of the Weesatche-Papalote and northern part of Straber.	Goliad Formation----	Miocene.

# NRCS Accessibility Statement

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### LEGEND

The texture given in the descriptive heading refers to the texture of the surface layer of the major soils

NEARLY LEVEL TO GENTLY SLOPING CLAYEY AND LOAMY SOILS  
ON UPLANDS

NEARLY LEVEL TO GENTLY SLOPING LOAMY SOILS ON UPLANDS

Nada-Telferner: Poorly drained and somewhat poorly drained, very slowly permeable loamy soils

**Telferner-Edna:** Somewhat poorly drained and poorly drained, very slowly permeable loamy soils

Inez: Somewhat poorly drained, very slowly permeable loamy soils

**Faddin-Edna:** Somewhat poorly drained and poorly drained, very slowly permeable loamy soils

NEARLY LEVEL TO GENTLY SLOPING SANDY, GRAVELLY, AND LOAMY  
SOILS ON UPLANDS

Straber: Moderately well drained, slowly permeable sandy soils

**Weesatche-Papalote:** Well drained and moderately well drained, moderately permeable and slowly permeable loamy soils

Garcitas: Somewhat poorly drained, very slowly permeable gravelly soils

Fordtran: Somewhat poorly drained, very slowly permeable sandy soils

NEARLY LEVEL CLAYEY SOILS ON FLOOD PLAINS

**Meguín-Trinity:** Well drained and somewhat poorly drained, moderately permeable and very slowly permeable clayey soils

**Rydolph-Trinity:** Somewhat poorly drained, slowly permeable and very slowly permeable clayey soils

Aransas-Austwell: Poorly drained, saline, very slowly permeable clayey soils

Compiled 1981

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

UNITED STATES DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE  
TEXAS AGRICULTURAL EXPERIMENT STATION

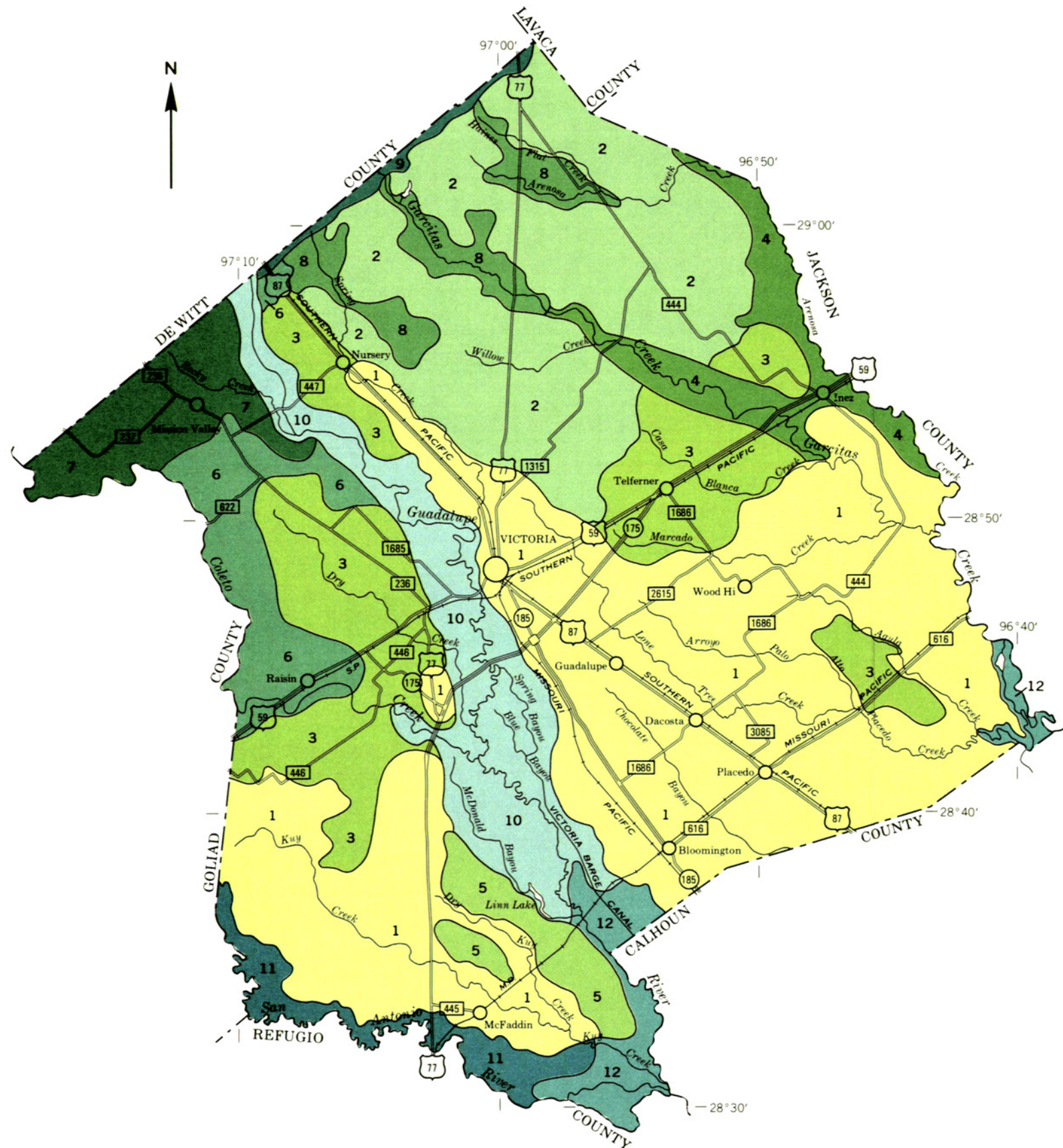
# GENERAL SOIL MAP

## VICTORIA COUNTY, TEXAS

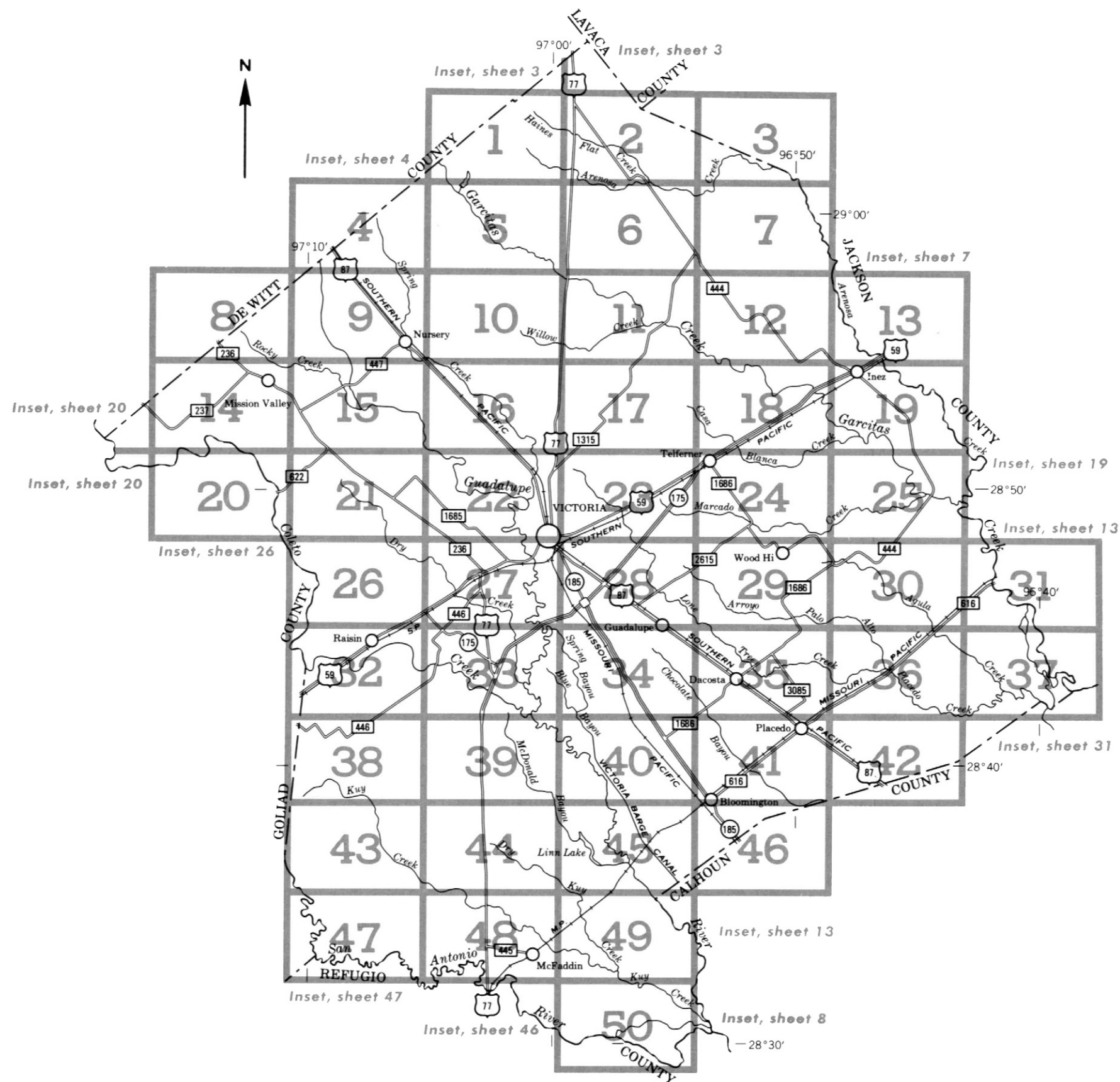
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1 0 5 10 Km

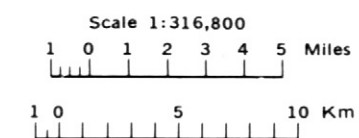






**Original text from each individual map sheet read:**  
 This map is compiled on 1977 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

# INDEX TO MAP SHEETS VICTORIA COUNTY, TEXAS



SOIL LEGEND

The first letter, always a capital, is the initial letter of the soil name. The second letter is used to identify separate mapping units that begin with the same first letter. The third letter, if used, is a capital and connotes slope class. Symbols without a slope letter are for nearly level soils or miscellaneous land types.

SYMBOL	NAME
Ar	Aransas clay, frequently flooded
Au	Austwell clay, frequently flooded
DaA	Dacosta sandy clay loam, 0 to 1 percent slopes
DaB	Dacosta sandy clay loam, 1 to 3 percent slopes
DnA	Dacosta-Contee complex, 0 to 1 percent slopes
DuB	Dacosta-Urban land complex, 0 to 3 percent slopes
DvC	Dacosta and Telferner soils, 2 to 5 percent slopes, eroded
Dw	Degola sandy clay loam, frequently flooded
DxB	Denhawken-Elmendorf complex, 0 to 2 percent slopes
EdA	Edna fine sandy loam, 0 to 1 percent slopes
EdB	Edna fine sandy loam, 1 to 3 percent slopes
FaA	Faddin fine sandy loam, 0 to 1 percent slopes
FaB	Faddin fine sandy loam, 1 to 3 percent slopes
FaC	Faddin fine sandy loam, 3 to 5 percent slopes
FoB	Fordtran loamy fine sand, 0 to 3 percent slopes
GaC	Garcitas gravelly loamy fine sand, 1 to 5 percent slopes
GdC	Goldmire very gravelly loamy fine sand, 1 to 5 percent slopes
InB	Inez fine sandy loam, 0 to 2 percent slopes
KyC	Kuy loamy sand, 0 to 5 percent slopes
LaA	Lake Charles clay, 0 to 1 percent slopes
LaB	Lake Charles clay, 1 to 3 percent slopes
LaD	Lake Charles clay, 5 to 8 percent slopes, eroded
LcB	Lake Charles-Urban land complex, 0 to 3 percent slopes
LmB	Leming loamy fine sand, 1 to 3 percent slopes
Me	Meguín silty clay, occasionally flooded
Mf	Meguín silty clay, frequently flooded
NcA	Nada-Cieno complex, 0 to 1 percent slopes
PaB	Papalote fine sandy loam, 1 to 3 percent slopes
Pb	Pits
Pd	Pits and Dumps
Pe	Placedo silty clay loam, frequently flooded
RaB	Runge fine sandy loam, 0 to 2 percent slopes
RaC	Runge fine sandy loam, 2 to 5 percent slopes
RbC	Rupley fine sand, 1 to 5 percent slopes
Rd	Rydolph silty clay, occasionally flooded
Rf	Rydolph silty clay, frequently flooded
SaB	Sarnosa loam, 1 to 3 percent slopes
SkC	Silvern very gravelly loamy sand, 1 to 5 percent slopes
Sn	Sinton loam, occasionally flooded
StB	Straber loamy fine sand, 0 to 2 percent slopes
StC	Straber loamy fine sand, 2 to 5 percent slopes
TeA	Telferner fine sandy loam, 0 to 1 percent slopes
TeB	Telferner fine sandy loam, 1 to 3 percent slopes
TfB	Telferner-Urban land complex, 0 to 3 percent slopes
TgC	Tremona gravelly loamy sand, 1 to 3 percent slopes
To	Trinity clay, occasionally flooded
Tr	Trinity clay, frequently flooded
VaD	Valco clay loam, 2 to 8 percent slopes
WeB	Weesatche sandy clay loam, 1 to 3 percent slopes
WeC	Weesatche sandy clay loam, 3 to 5 percent slopes
Za	Zalco fine sand, frequently flooded

CONVENTIONAL AND SPECIAL  
SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES	
National, state or province	
County or parish	
Minor civil division	
Reservation (national forest or park, state forest or park, and large airport)	
Land grant	
Limit of soil survey (label)	
Field sheet matchline & neatline	
AD HOC BOUNDARY (label)	
Small airport, airfield, park, oilfield, cemetery, or flood pool	
STATE COORDINATE TICK	
LAND DIVISION CORNERS (sections and land grants)	
ROADS	
Divided (median shown if scale permits)	
Other roads	
Trail	
ROAD EMBLEM & DESIGNATIONS	
Interstate	
Federal	
State	
County, farm or ranch	
RAILROAD	
POWER TRANSMISSION LINE (normally not shown)	
PIPE LINE (normally not shown)	
FENCE (normally not shown)	
LEVEES	
Without road	
With road	
With railroad	
DAMS	
Large (to scale)	
Medium or small	
PITS	
Gravel pit	
Mine or quarry	

MISCELLANEOUS CULTURAL FEATURES	
Farmstead, house (omit in urban areas)	
Church	
School	
Indian mound (label)	
Located object (label)	
Tank (label)	
Wells, oil or gas	
Windmill	
Kitchen midden	

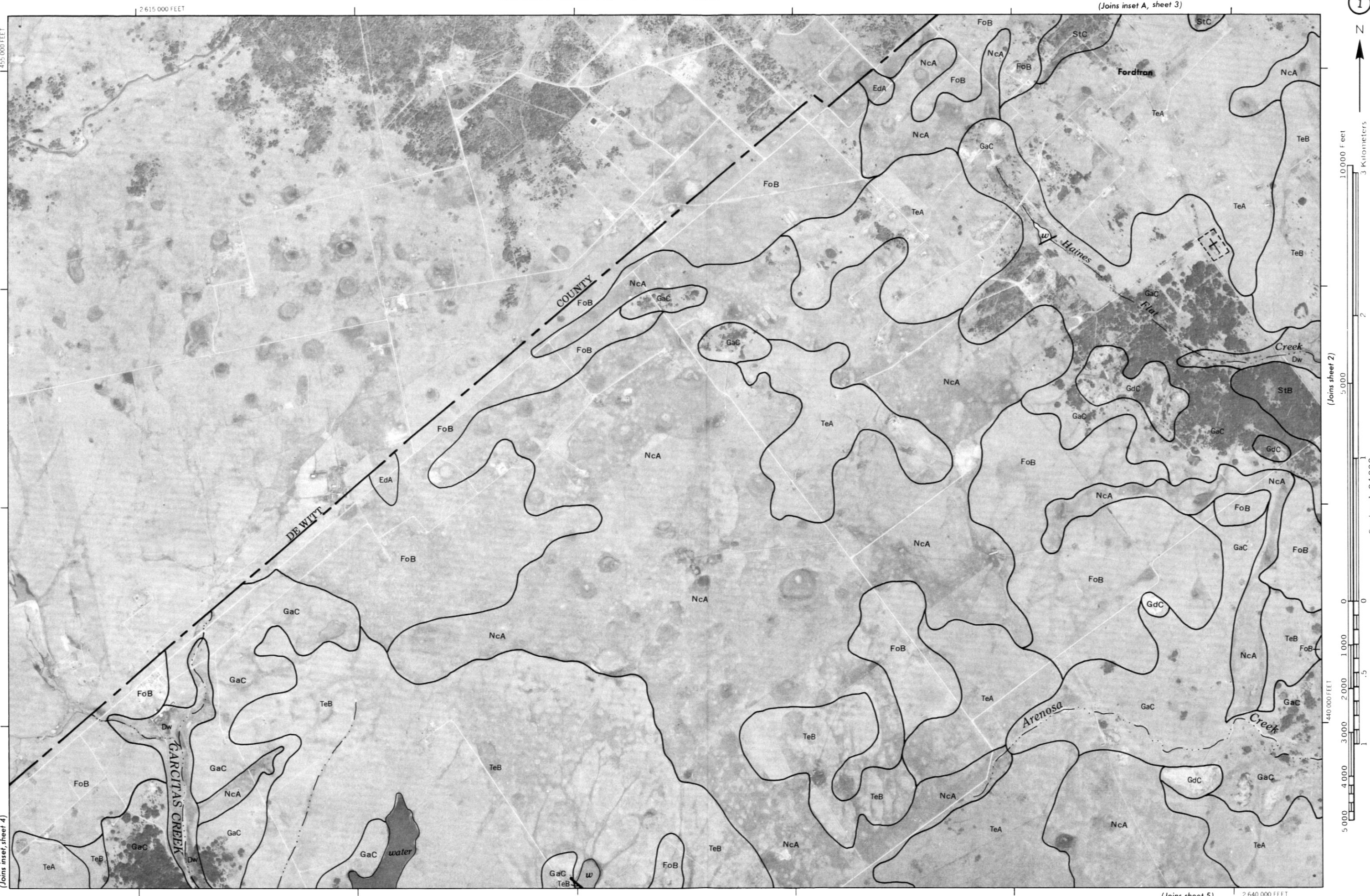
WATER FEATURES

DRAINAGE	
Perennial, double line	
Perennial, single line	
Intermittent	
Drainage end	
Canals or ditches	
Double-line (label)	
Drainage and/or irrigation	
LAKES, PONDS AND RESERVOIRS	
Perennial	
Intermittent	
MISCELLANEOUS WATER FEATURES	
Marsh or swamp	
Spring	
Well, artesian	
Well, irrigation	
Wet spot	

SPECIAL SYMBOLS FOR  
SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS	
ESCARPMENTS	
Bedrock (points down slope)	
Other than bedrock (points down slope)	
SHORT STEEP SLOPE	
GULLY	
DEPRESSION OR SINK	
SOIL SAMPLE SITE (normally not shown)	
MISCELLANEOUS	
Blowout	
Clay spot	
Gravelly spot	
Gumbo, slick or scabby spot (sodic)	
Dumps and other similar non soil areas	
Prominent hill or peak	
Rock outcrop (includes sandstone and shale)	
Saline spot	
Sandy spot	
Severely eroded spot	
Slide or slip (tips point upslope)	
Stony spot, very stony spot	





10 000 Feet  
3 Kilometers

(Joins sheet 2)

Scale - 1:24 000

1440 000 FEET



(Joins inset B, sheet 3)

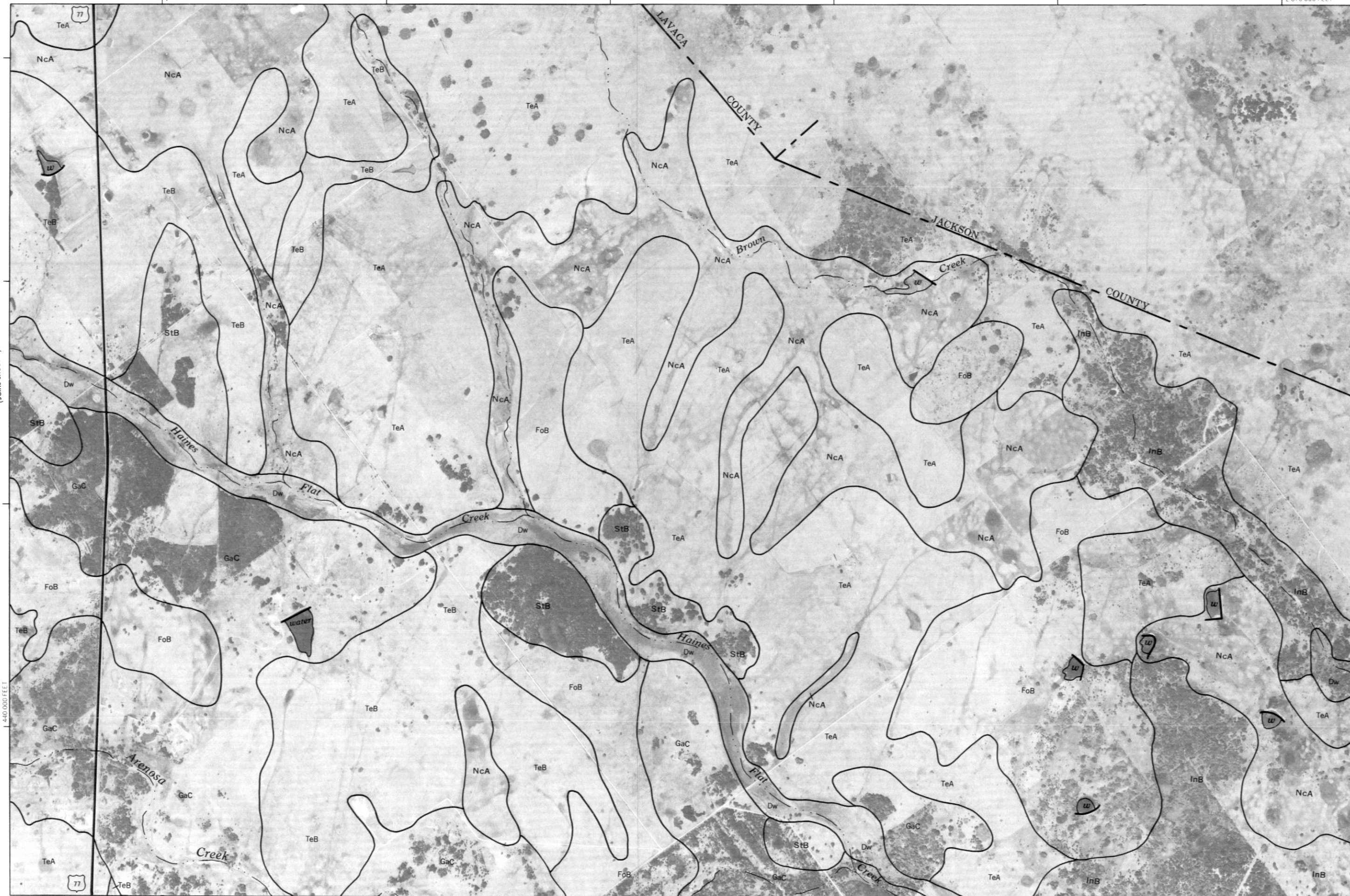
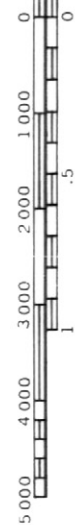
2 670 000 FEET



10,000 Feet  
3 Kilometers

(Joins sheet 1)

Scale - 1:24 000



(Joins sheet 6) 2 645 000 FEET

(Joins sheet 3)





10,000 Feet  
3 Kilometers



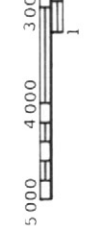
5,000  
2

Scale - 1:24,000



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0.5

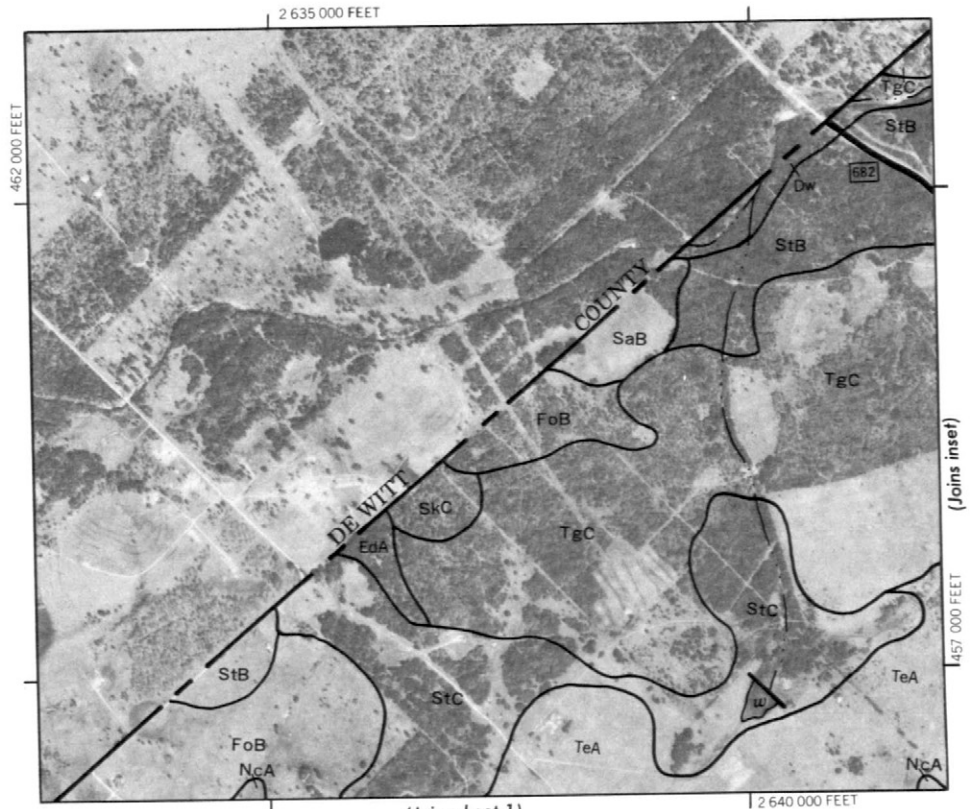
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2,000  
3,000  
4,000  
5,000



0  
1  
0.5



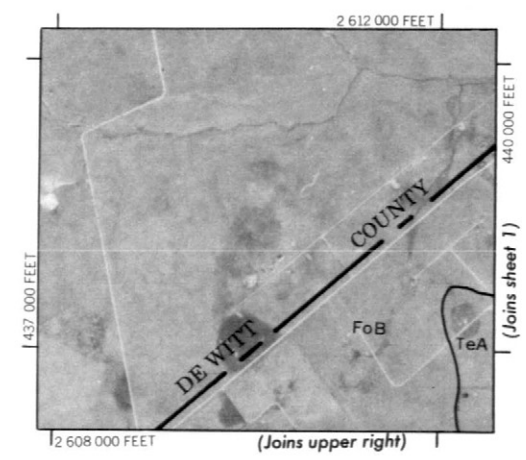
INSET A



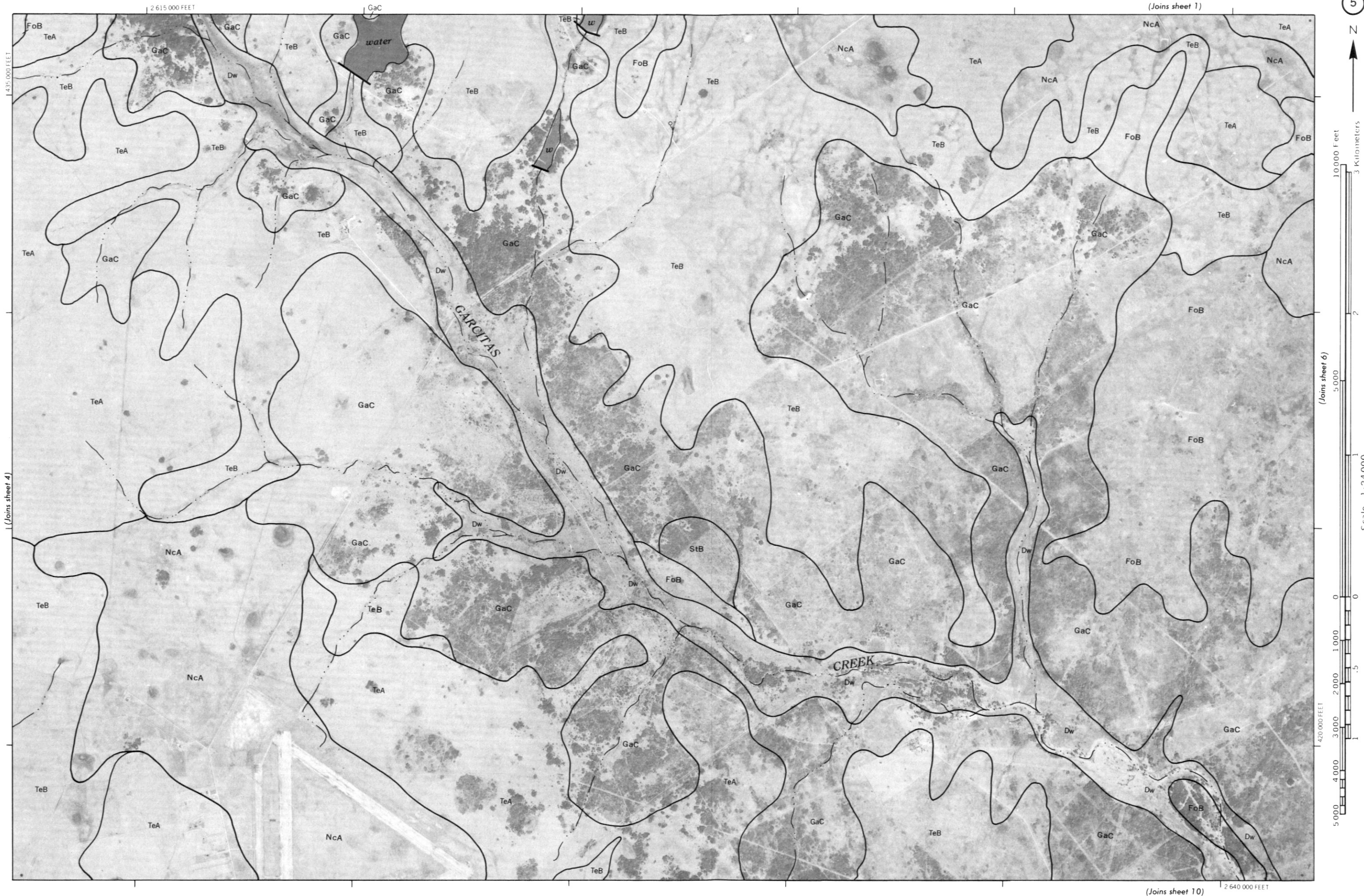
INSET B













(Joins sheet 2)

2 670 000 FEET

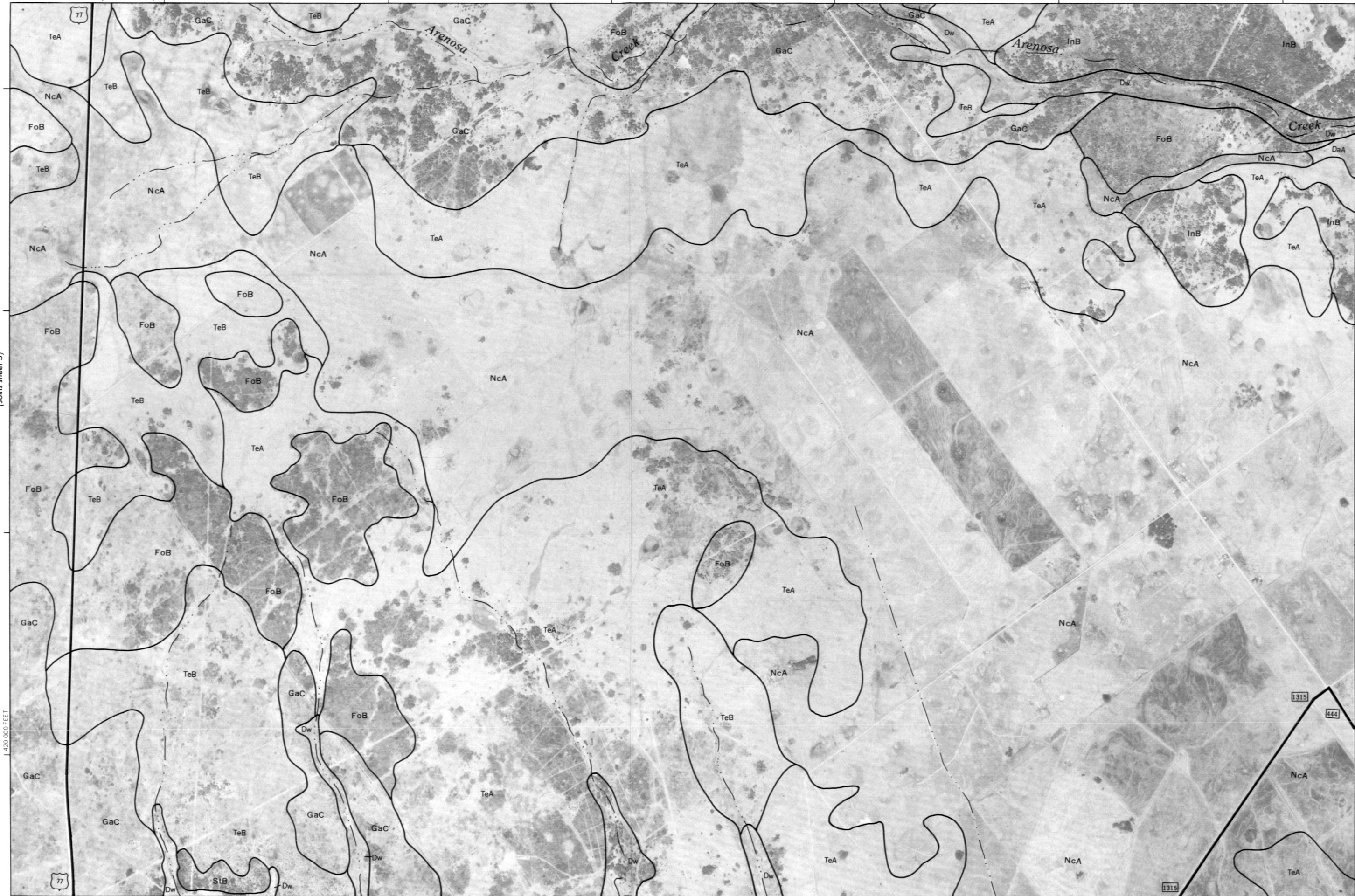


10 000 Feet  
3 Kilometers

(Joins sheet 5)

Scale - 1:24 000

5 000  
4 000  
3 000  
2 000  
1 000  
0  
0  
0.5  
1



(Joins sheet 11) 2 645 000 FEET

(Joins sheet 7)

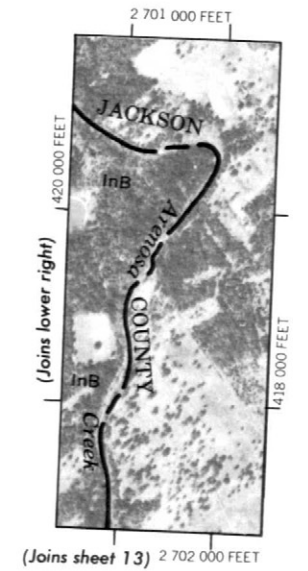
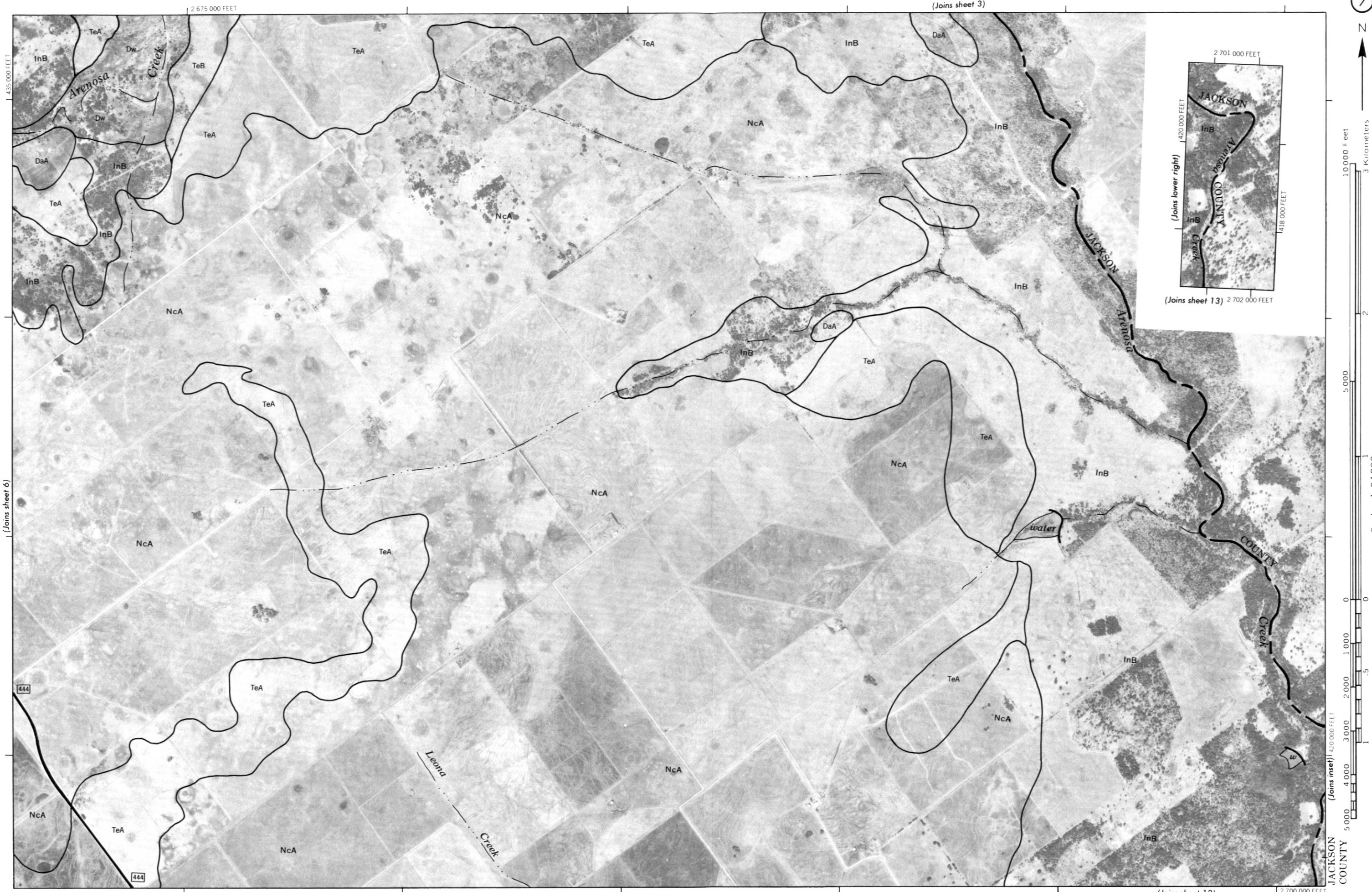


(Joins sheet 3)



10 000 Feet  
3 Kilometers

Scale - 1:24 000



(Joins sheet 6)

(Joins inset)

JACKSON COUNTY

(Joins sheet 12)

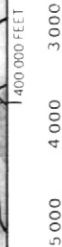
2 700 000 FEET





(Joins sheet 14)







(Joins sheet 5)

2 640 000 FEET



10,000 Feet  
3 Kilometers



5,000

0

Scale - 1:24 000

0

1,000

2,000

3,000

4,000

5,000

(Joins sheet 9)

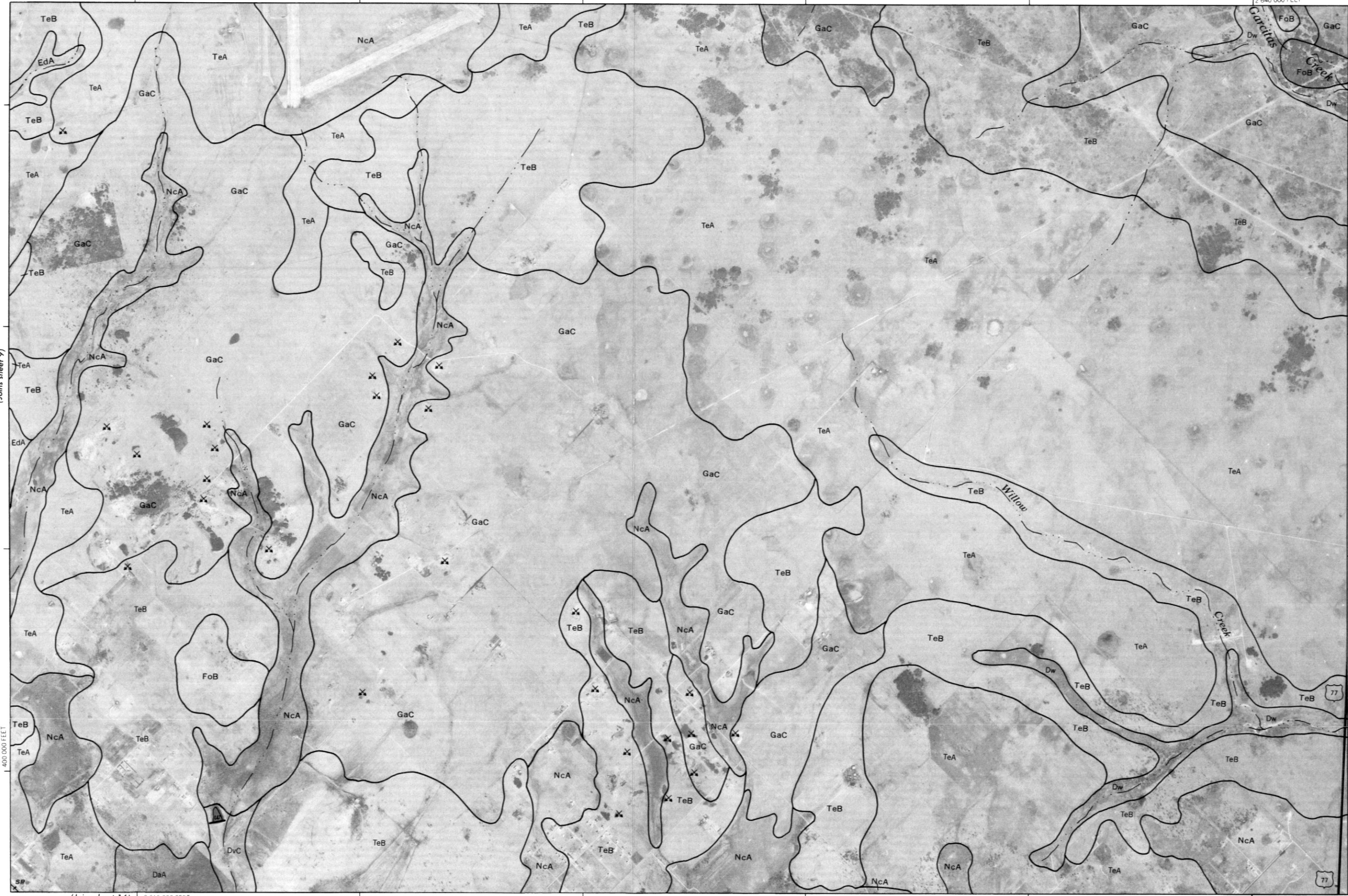
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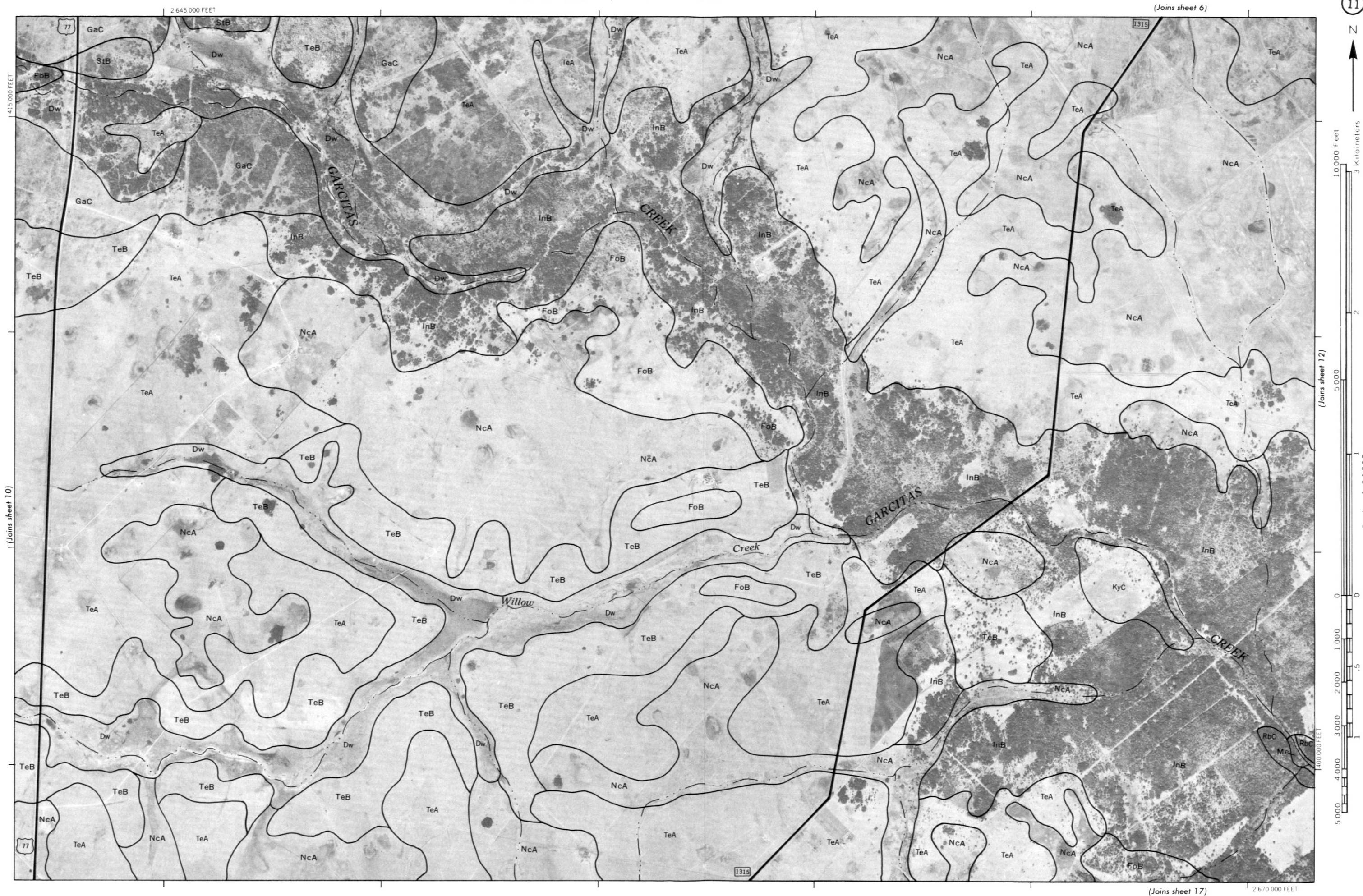
2 615 000 FEET

415 000 FEET

(Joins sheet 11)







(Joins sheet 10)

(Joins sheet 12)



(Joins sheet 7)

2 700 000 FEET

JACKSON COUNTY



10,000 Feet  
3 Kilometers



5,000

10,000

15,000

20,000

25,000

30,000

35,000

40,000

45,000

50,000

55,000

60,000

(Joins sheet 11)

Scale - 1:24 000

400 000 FEET

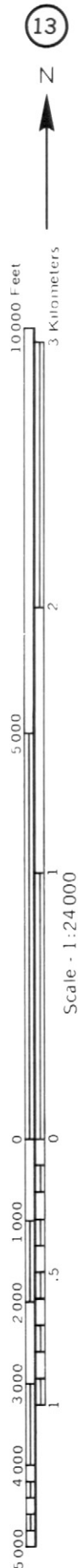
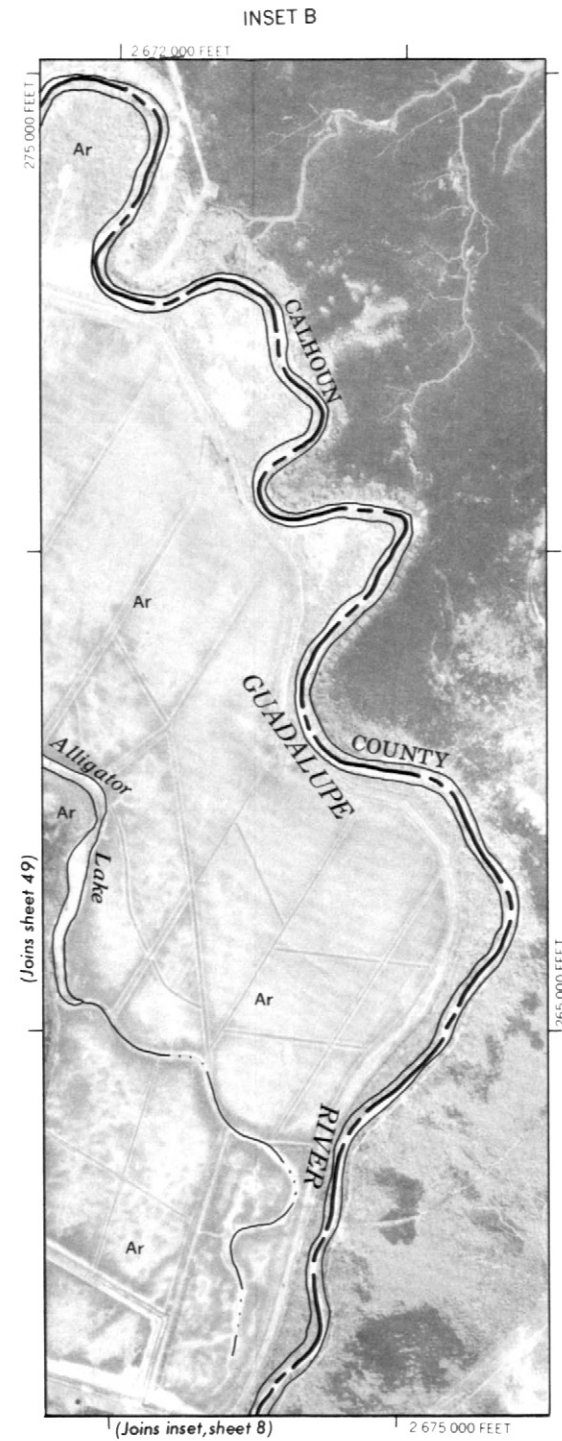
(Joins sheet 13)

(Joins sheet 18)

2 675 000 FEET











Scale - 1:24,000

(Joins inset, sheet 20)

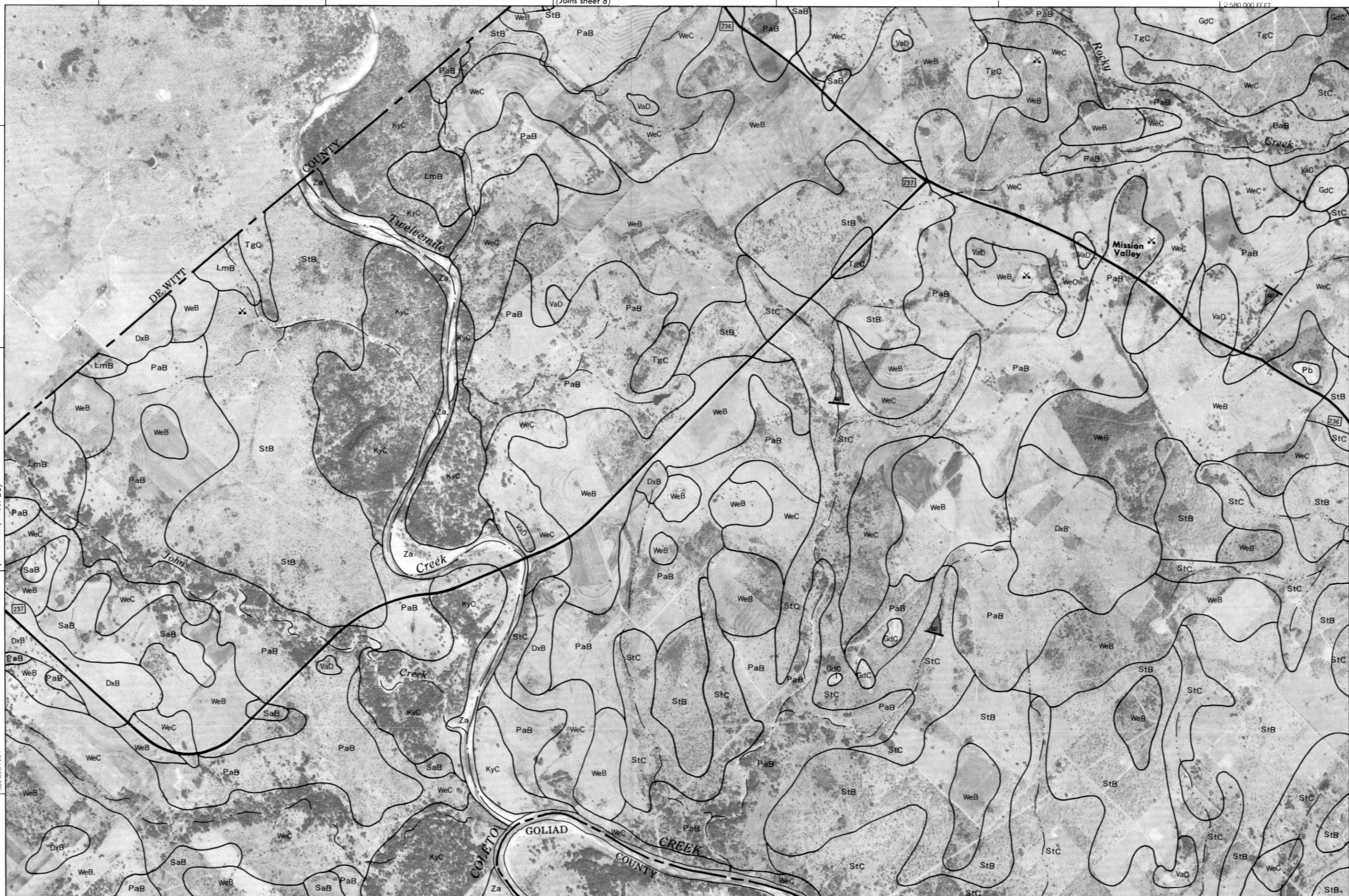
380,000 FEET

(Joins sheet 8)

12,580,000 FEET

395,000 FEET

(Joins sheet 15)



12,555,000 FEET (Joins sheet 20)





10 000 Feet  
3 Kilometers

2

5 000

1

0

0

0

1 000

2 000

3 000

4 000

5 000

1 380 000 FEET

Scale - 1:24 000

(Joins sheet 16)





(Joins sheet 10)

2 640 000 FEET



10 000 Feet  
3 Kilometers



5 000  
0

Scale - 1:24 000

0 1 2

0 0

1 000

2 000

3 000

4 000

5 000



(Joins sheet 22) 2 615 000 FEET

(Joins sheet 17)

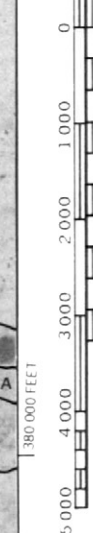




10 000 Feet  
3 Kilometers

(Joins sheet 18)

Scale - 1:24 000



380 000 FEET

2 645 000 FEET

395 000 FEET

(Joins sheet 16)





(Joins sheet 12)



10,000 Feet  
3 Kilometers



5,000  
0  
1  
2

Scale - 1:24,000



5,000  
4,000  
3,000  
2,000  
1,000  
0  
0.5  
1

(Joins sheet 24)

2 675 000 FEET

2 700 000 FEET

2 675 000 FEET

(Joins sheet 19)







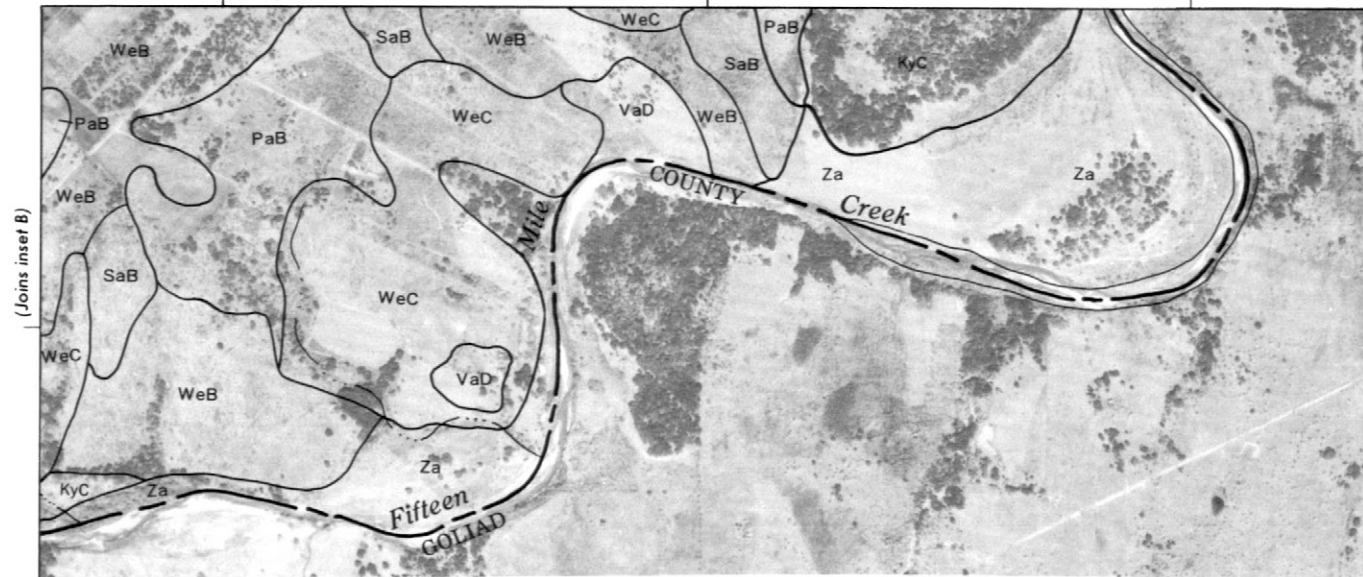


(Joins sheet 14)

2 580 000 FEET



10,000 Feet  
3 Kilometers

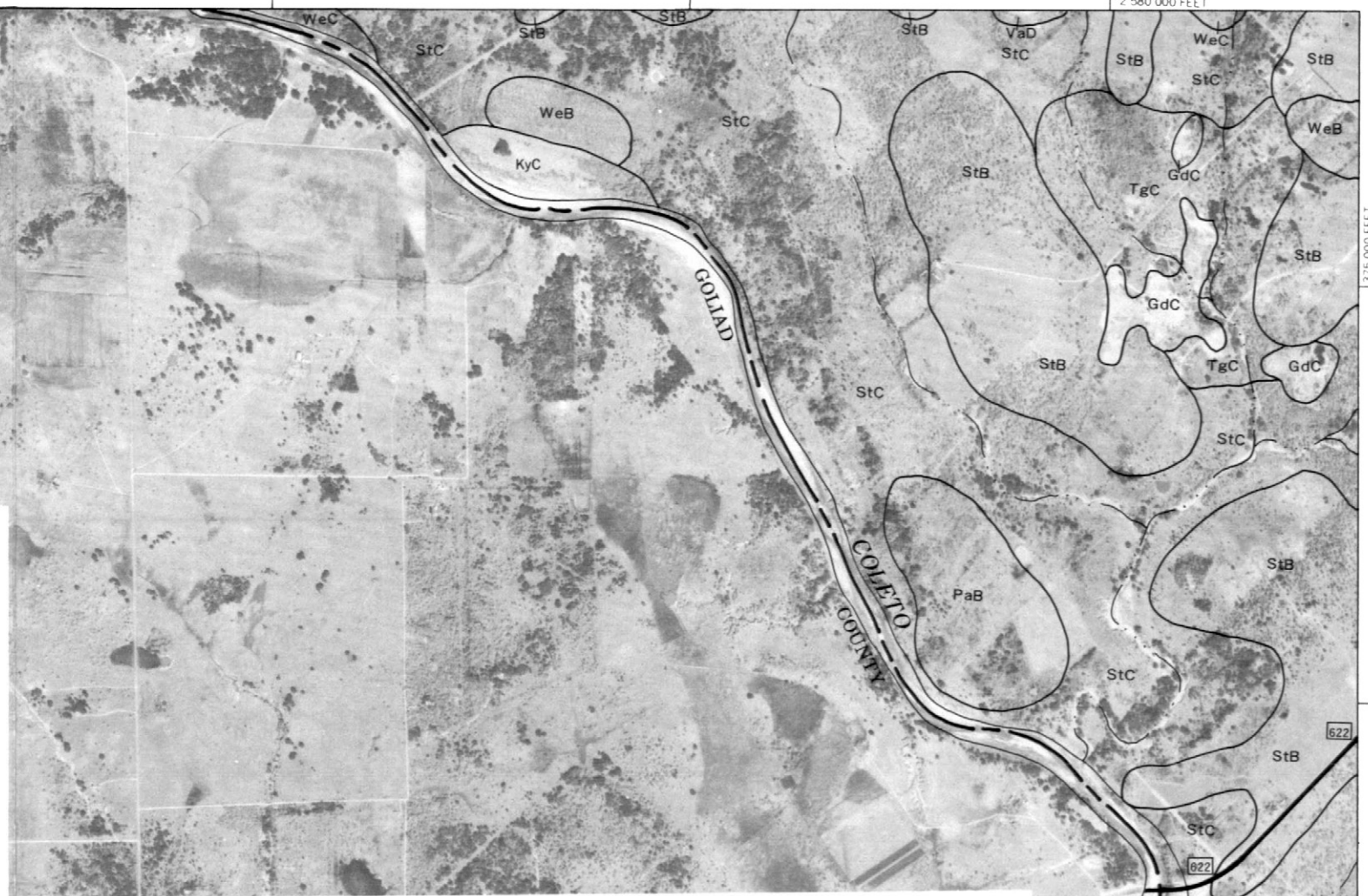


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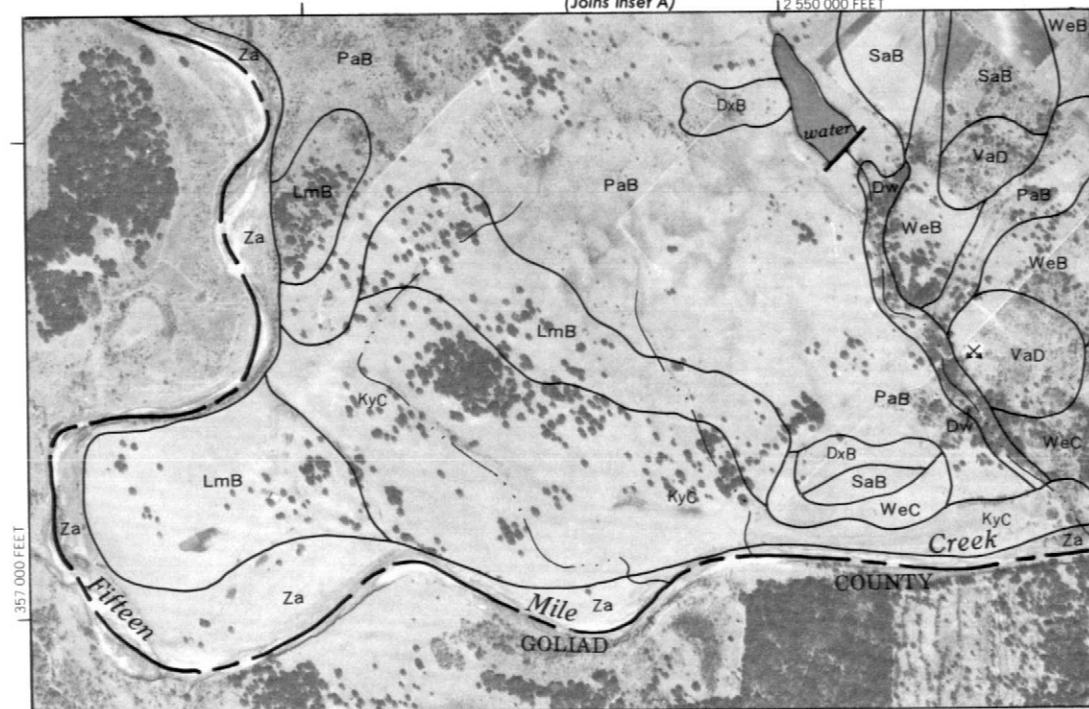
(Joins inset B)

(Joins sheet 14)



INSET B

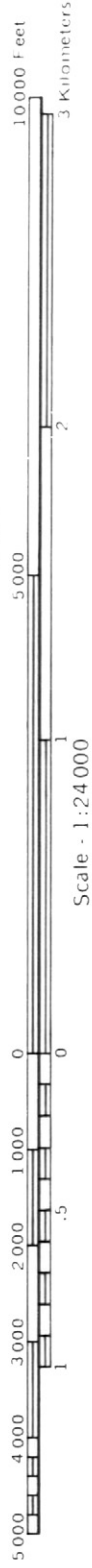
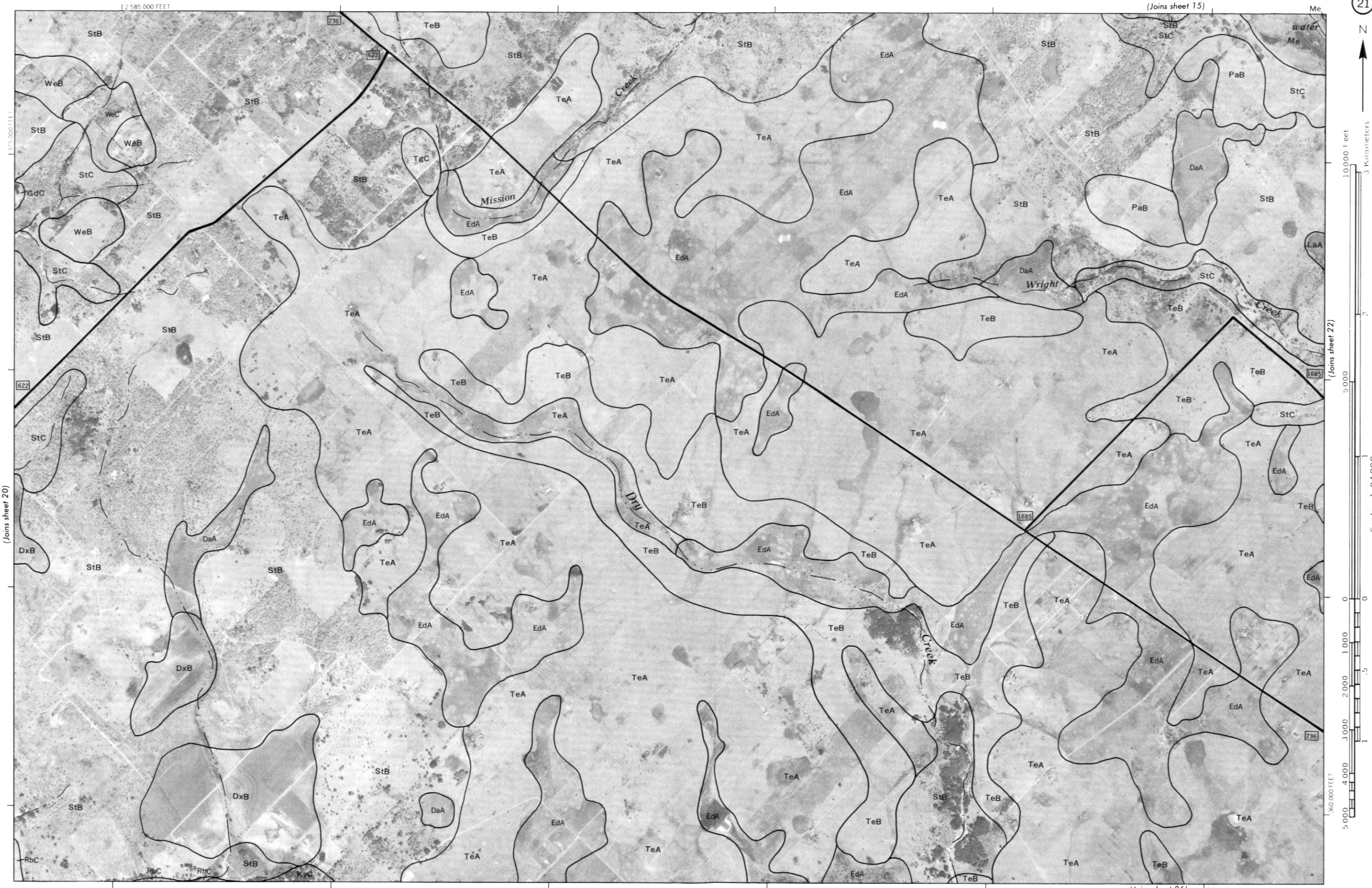
(Joins inset A)



(Joins upper left)

(Joins sheet 21)





(Joins sheet 20)

(Joins sheet 22)

(Joins sheet 15)

(Joins sheet 26)



(Joins sheet 16)

12 640 000 FEET



10 000 Feet  
3 Kilometers

5 000

Scale - 1:24 000

0 1 000 2 000 3 000 4 000 5 000

360 000 FEET

12 615 000 FEET (Joins sheet 27)



(Joins sheet 23)





10,000 Feet  
3 Kilometers

(Joins sheet 24)

Scale - 1:24,000

160,000 FEET

2 645 000 FEET

2 670 000 FEET



(Joins sheet 22)

**VICTORIA**  
(county seat)

**VICTORIA**  
**REGIONAL**  
**AIRPORT**

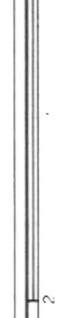


(Joins sheet 18)

2 700 000 FEET



10 000 Feet  
3 Kilometers



5 000

(Joins sheet 23)

Scale - 1:24 000

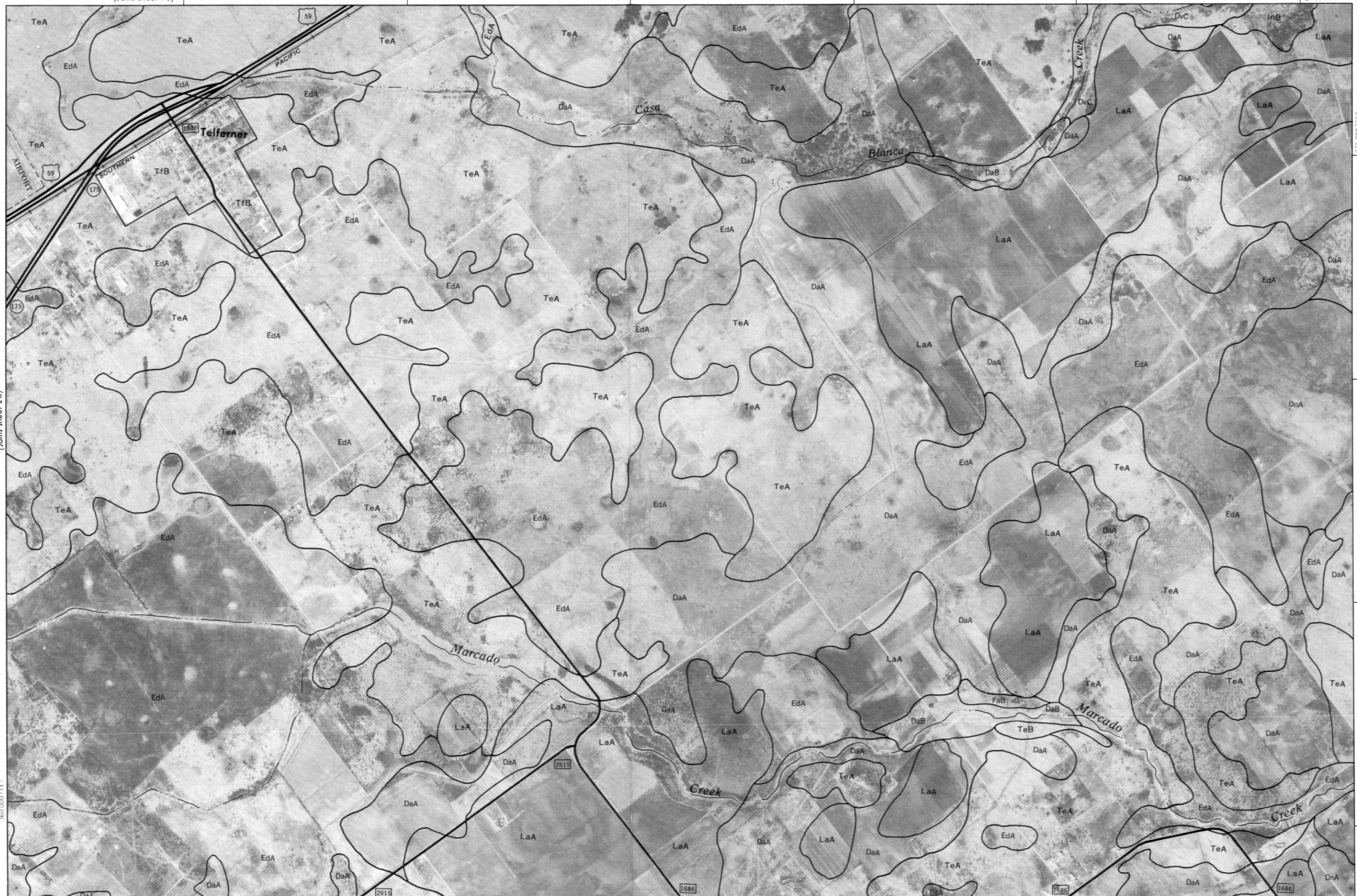


0 1 000 2 000 3 000 4 000 5 000

360 000 FEET

2 675 000 FEET

(Joins sheet 29)



1375 000 FEET

(Joins sheet 25)



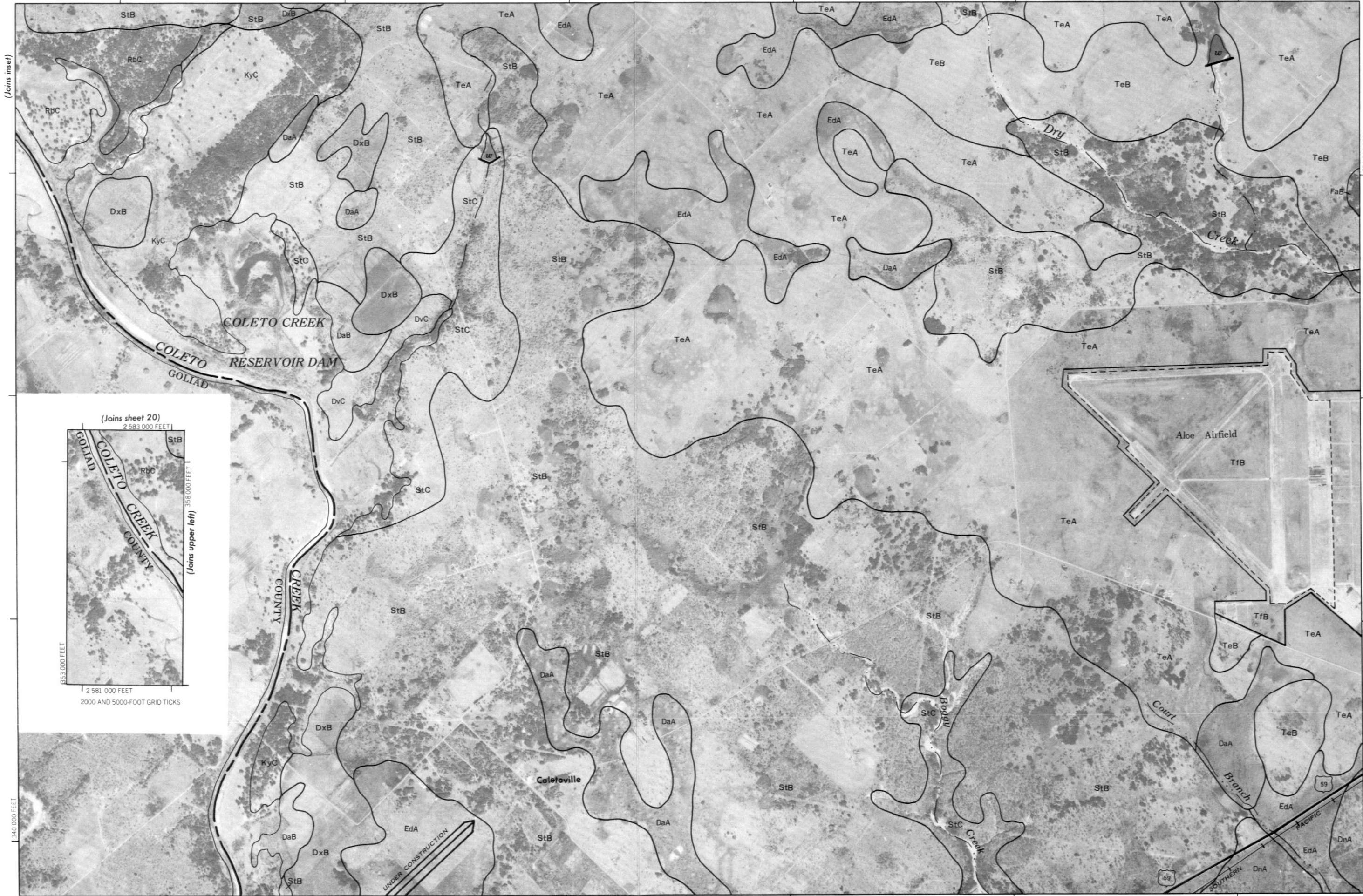
JACKSON  
COUNTY

(Joins sheet 30) 2 730 000 FEET



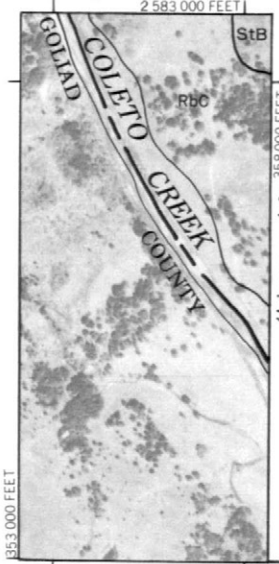
(Joins sheet 21)

12 610 000 FEET



(Joins sheet 20)

2 583 000 FEET



(Joins upper left)

2 585 000 FEET

(Joins sheet 32)

(Joins sheet 27)









10 000 Feet  
3 Kilometers

5 000

1

1

0

0

0

0

0

0

0

0

0

0

0

0

0

0

0

0

0

0

0

(Joins sheet 27)

Scale - 1:24 000



(Joins sheet 29)





2 700 000 FEET



(Joins sheet 25)



10 000 Feet  
3 Kilometers



5 000  
2

Scale - 1:24 000



0 0 1 000 2 000 3 000 4 000 5 000

0 0 1 000 2 000 3 000 4 000 5 000

0 0 1 000 2 000 3 000 4 000 5 000

0 0 1 000 2 000 3 000 4 000 5 000

0 0 1 000 2 000 3 000 4 000 5 000

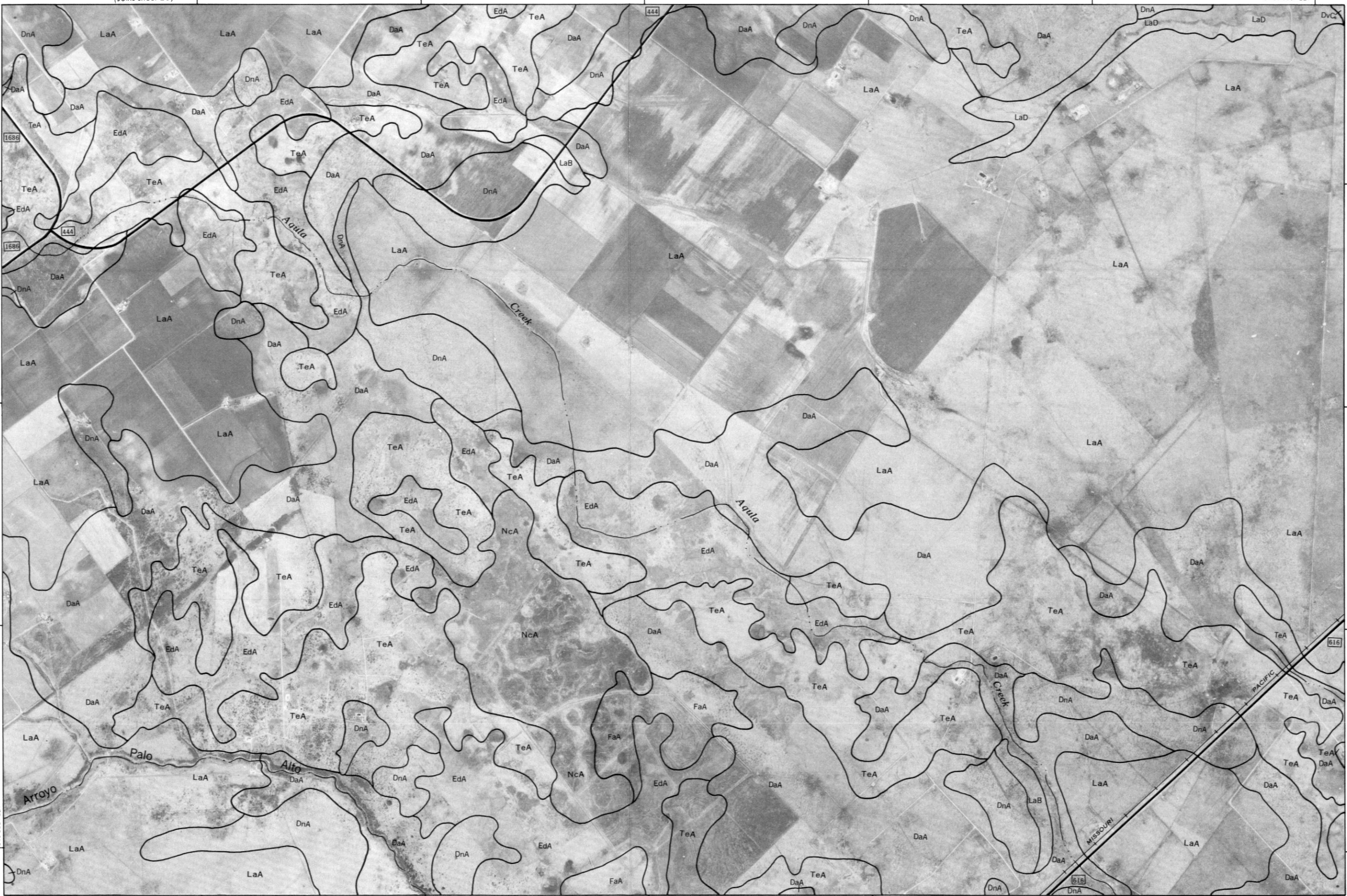
0 0 1 000 2 000 3 000 4 000 5 000

(Joins sheet 36)

2 705 000 FEET

355 000 FEET

(Joins sheet 31)







10 000 Feet  
3 Kilometers

2

5 000

1

0

0

1 000

2 000

3 000

4 000

5 000

340 000 FEET

2 760 000 FEET

Scale - 1:24 000





(Joins sheet 26)

2 610 000 FEET



10 000 Feet  
3 Kilometers



5 000



Scale - 1:24 000



0 1 2 3 4 5



0 1 2 3 4 5



0 1 2 3 4 5



2 585 000 FEET (Joins sheet 38)

(Joins sheet 33)





(Joins sheet 34)

Scale - 1:24000





335 000 FEET







10,000 Feet  
3 Kilometers

2

5,000

1

Scale - 1:24,000

0

0

1,000

2,000

3,000

4,000

5,000

1

.5

0

0

1,000

2,000

3,000

4,000

5,000

1

.5

0

0

1,000

2,000

3,000

4,000

5,000

1

.5

0

0

1,000

2,000

3,000

4,000

5,000



(Joins sheet 34)

(Joins sheet 36)



(Joins sheet 30)

2 730 000 FEET



10,000 Feet  
3 Kilometers



5,000  
0  
1  
2  
(Joins sheet 35)

Scale - 1:24 000

0  
0



5,000  
4,000  
3,000  
2,000  
1,000  
0  
1  
2  
3  
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2 735 000 FEET

(Joins sheet 31)

10 000 Feet  
3 Kilometers

Scale - 1:24 000

1 320 000 FEET

2 760 000 FEET



(Joins sheet 36)

(Joins inset, sheet 31)



(Joins sheet 32)

12 510 000 FEET



10 000 Feet  
3 Kilometers



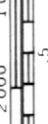
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Scale - 1:24 000



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4 000



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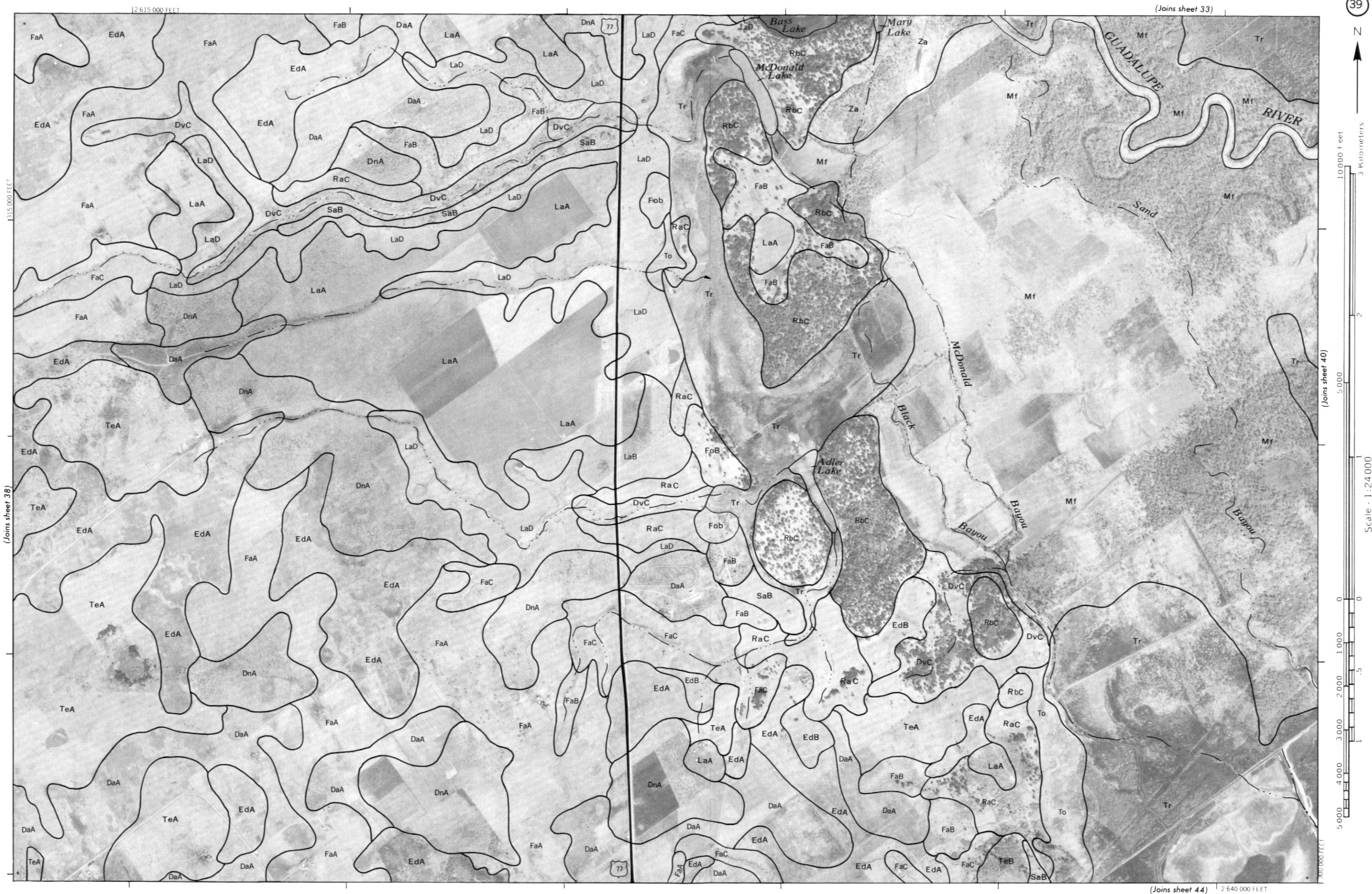
12 585 000 FEET (Joins sheet 43)



13 15 000 FEET

(Joins sheet 39)











2 675 000 FEET

(Joins sheet 35)



10 000 Feet  
3 Kilometers

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(Joins sheet 38)



10,000 Feet  
3 Kilometers

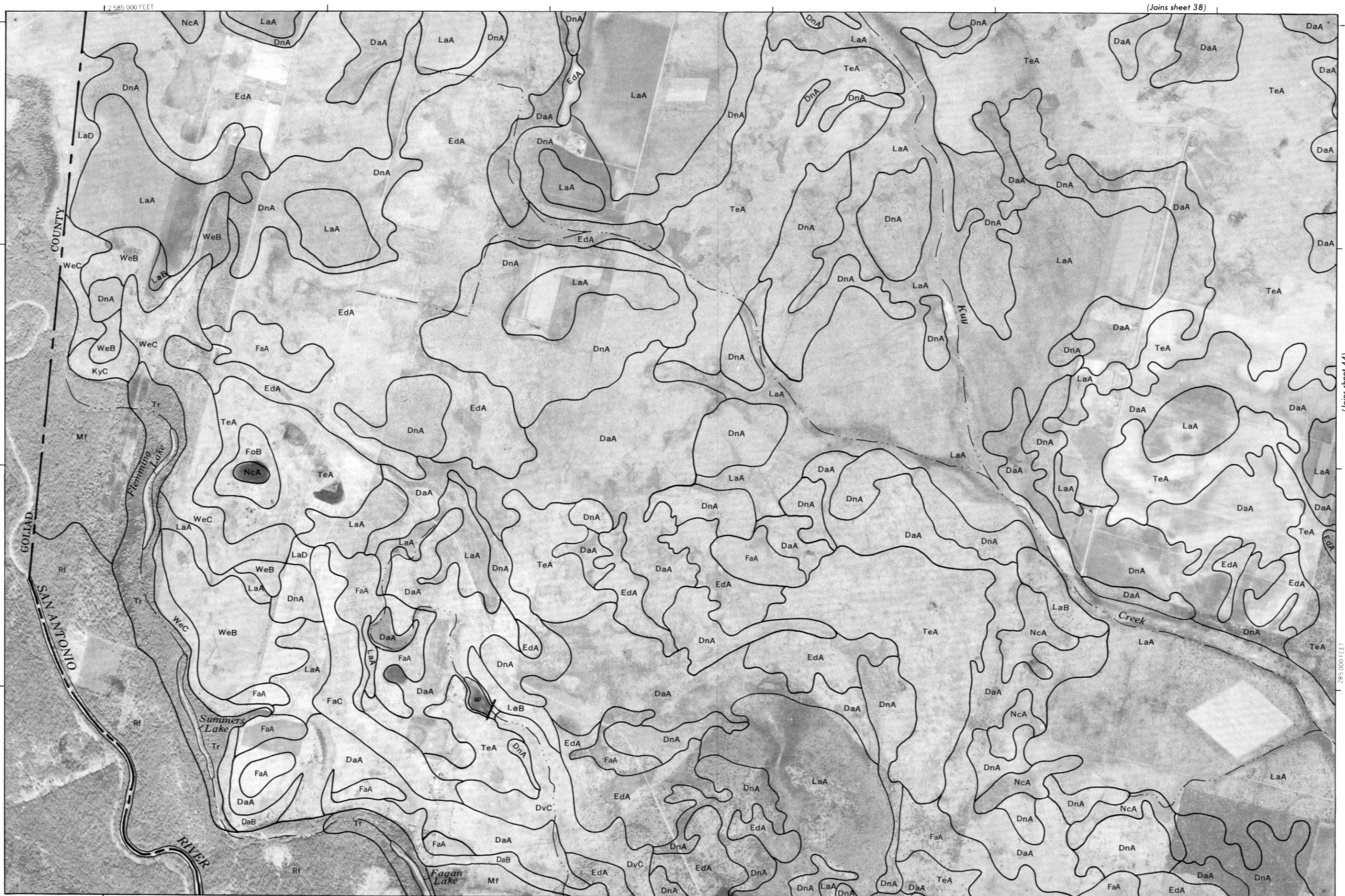
2

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Scale - 1:24,000

5,000 4,000 3,000 2,000 1,000 0 0.5 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

(Joins sheet 47) 1:26,000 FEET













(Joins sheet 41)

2 670 000 FEET



10 000 Feet  
3 Kilometers



5 000  
(Joins sheet 45)

Scale - 1:24 000



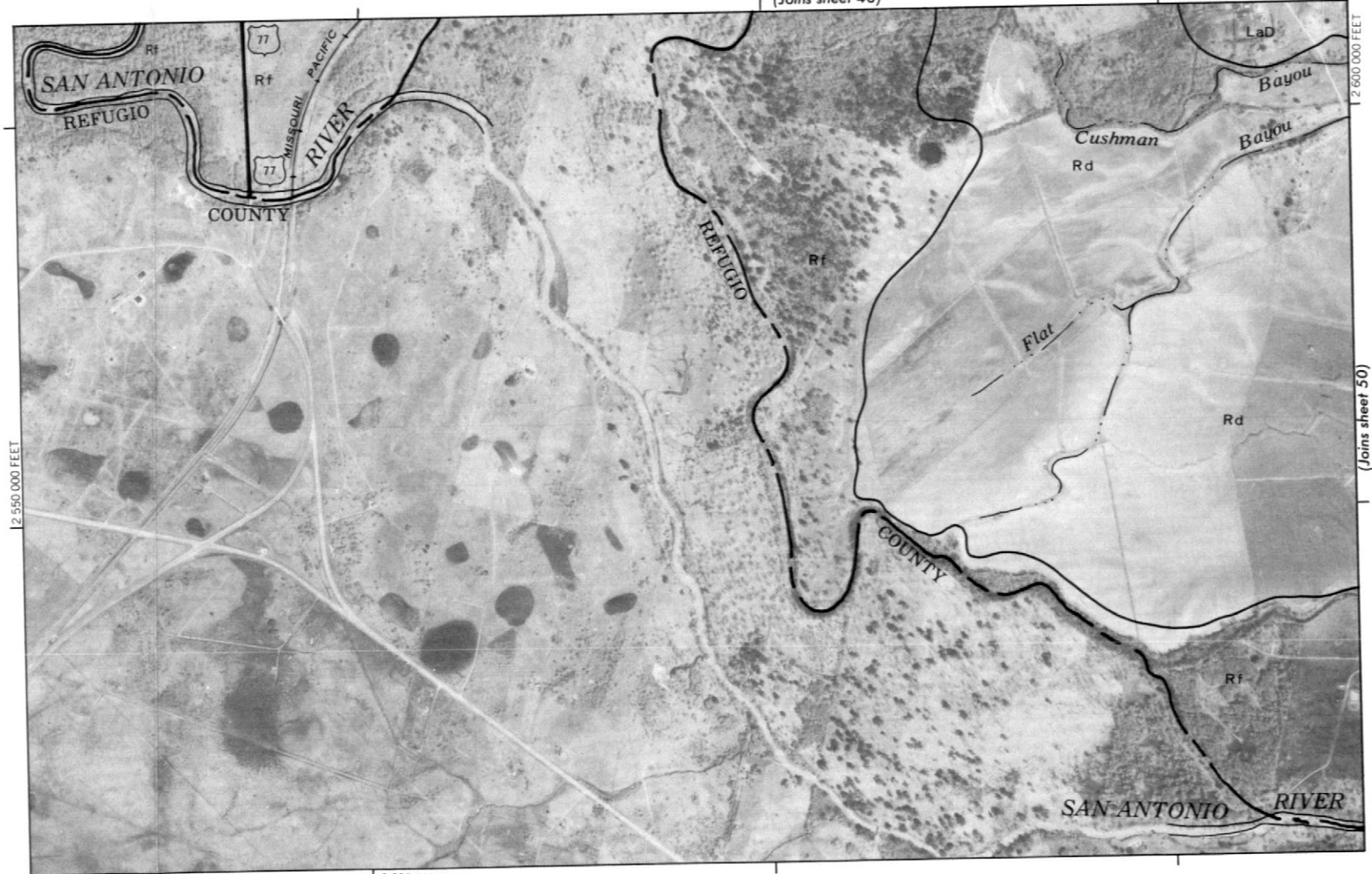
5 000



2 675 000 FEET

(Joins sheet 48)

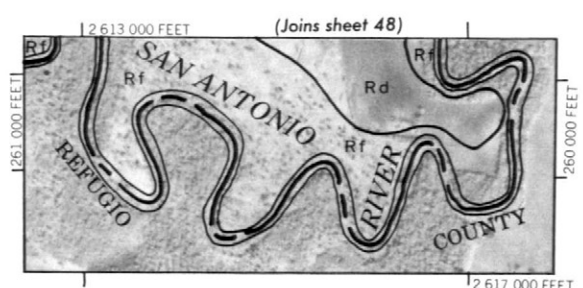
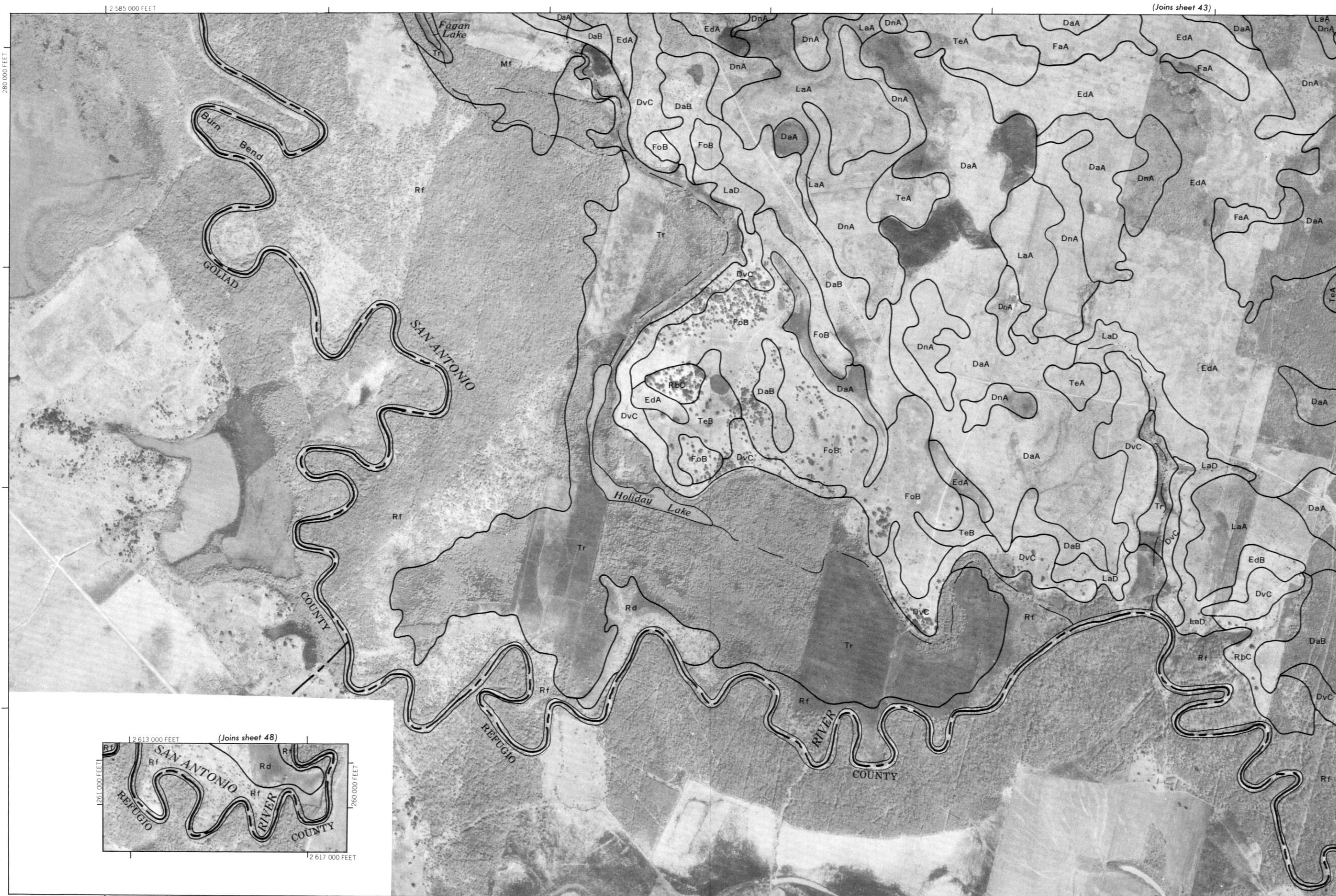
2 640 000 FEET



2 630 000 FEET

(Joins sheet 50)







(Joins sheet 44)



(Joins sheet 47)

Scale · 1:24 000



(Joins sheet 49)

SAN ANTONIO RIVER

2 615 000 FEET

(Joins inset, sheet 47)

(Joins inset, sheet 46)







(Joins sheet 49)

12 670 000 FEET



10 000 Feet  
3 Kilometers

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Scale - 1:24 000

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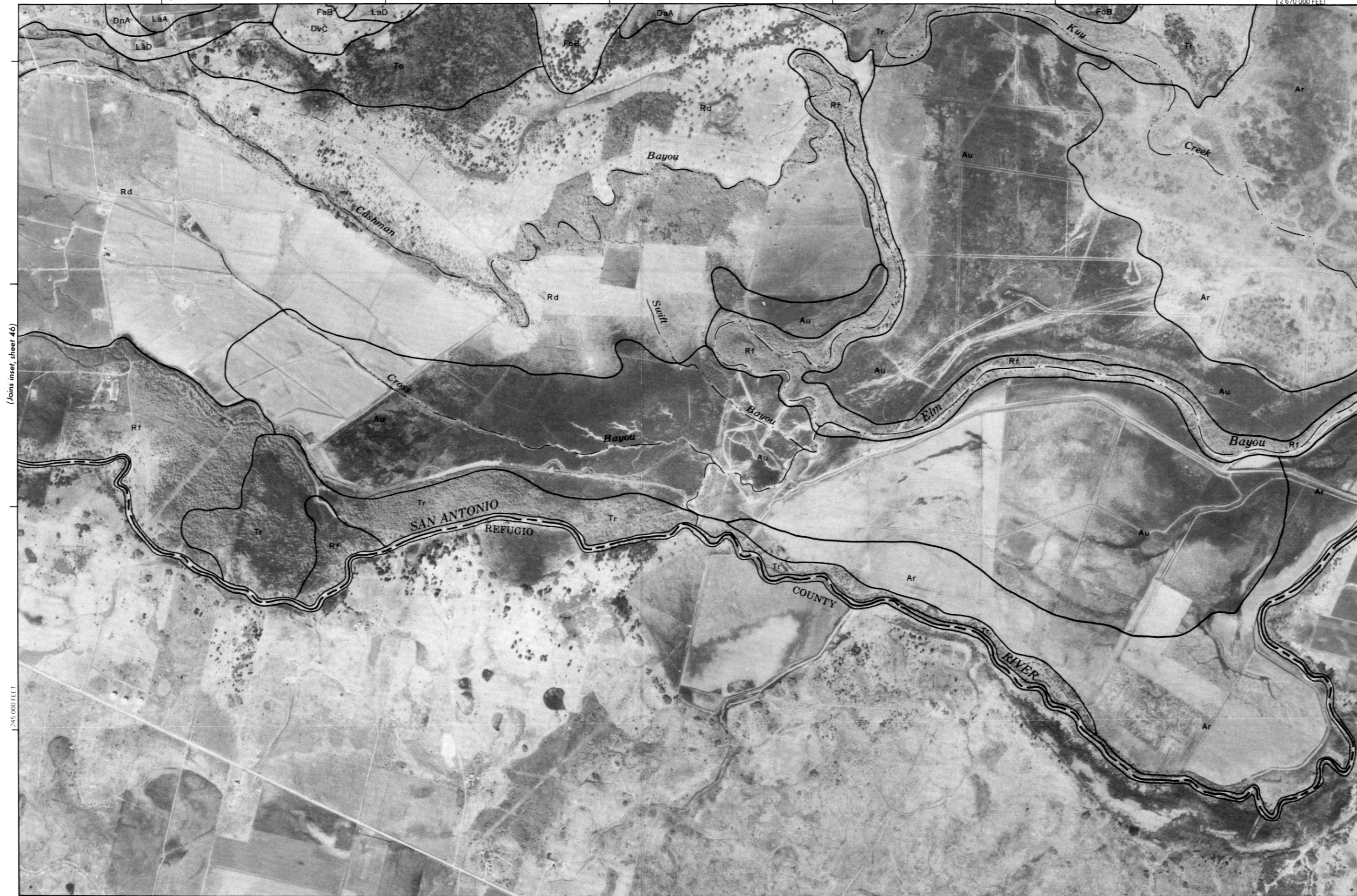
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(Joins inset, sheet 46)

(Joins inset, sheet 8)

12 645 000 FEET

260 000 FEET